Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

June 14, 1990

Addressees

ENVIRONMENTAL DATA ADMINISTRATION PLAN

Enclosed for your review and comment are two copies of the above plan. The Environmental Data Administration Plan (EDAP) identifies the approach and conduct of all activities related to the collection, analysis and administration of documentation of all data gathered at the Weldon Spring Site. The EDAP discusses methods used for acquiring data, programs for quality assurance, and maintenance of the data. This includes sampling plan preparation, data verification and validation, data base administration and data archiving.

Please provide any comments by July 6, 1990.

Sincerely,

Stephen H. McCracken
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosure:
As Stated

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DOE/OR/21548-119

(CONTRACT NO. DE-AC05-86OR21548)

SUPERCEDED

ENVIRONMENTAL DATA ADMINISTRATION PLAN

For the
Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

Prepared by MK-Ferguson Company and Jacobs Engineering Group

MAY 1990 REV. 0

U.S. Department Of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

ATTENTION!!

ZZ-217 DOE/OR/21548-119

IS NOW OBSOLETE

DOE/OR/21548-119

Weldon Spring Site Remedial Action Project

Environmental Data Administration Plan

May 1990

Revision 0

Prepared by

MK-FERGUSON COMPANY
and
JACOBS ENGINEERING GROUP
7295 Highway 94 South
St. Charles, Missouri 63303

Prepared for

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Under Contract DE-AC05-86OR21548

EDAP/TXTJOANN

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ABSTRACT

Environmental monitoring and surveillance activities at Weldon Spring Site Remedial Action Project (WSSRAP) result in data and documentation that is used to develop remedial action alternatives and demonstrate compliance with U.S. Department of Energy (DOE) environmental protection policies.

This Environmental Data Administration Plan (EDAP) summarizes standard operating procedures and data quality objectives developed for use in the collection and analysis of environmental data. Data quality review programs are conducted to ensure data integrity and validity. The EDAP describes administration procedures adopted at WSSRAP to manage the use of environmental data.

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1 INTRODUCTION

Environmental monitoring, surveillance, and characterization activities are conducted at the Weldon Spring Site (WSS) as part of the Weldon Spring Site Remedial Action Project (WSSRAP). These activities are described in detail in numerous sampling plans, monitoring programs, and permits. Environmental monitoring activities are conducted at the WSS to ensure that any potential public exposure is documented and quantified in an effort to protect the health and safety of the public. These activities are also required to demonstrate compliance with regulatory requirements and U.S. Department of Energy (DOE) environmental protection policies (MKF and JEG, 1990a).

Two major types of information are collected and evaluated during the environmental monitoring activities: documentation (field notes, data quality reviews) and data (analytical). The information collected is used to support an evaluation of alternative remedial actions. Future environmental sampling activities will provide data on which to evaluate remedial efforts, public and worker safety and protection of the environment.

Data quality objectives (DQOs) have been established in accordance with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) guidelines for environmental data. DQOs are qualitative and quantitative statements which specify characteristics of the data required to support U.S. Environmental Protection Agency (EPA) decisions during remedial action activities (EPA, 1987). The DQOs identify specific goals for WSSRAP data which include Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC). The DQO plan reviews these goals and is presented in Appendix A. The WSSRAP DQOs are standard in their application and are used as a guideline for WSSRAP.

Standard Operating Procedures (SOPs) have been developed to provide consistency in methodology, reporting of data, and documentation of environmental activities. SOPs include procedures for sample collection and identification and for data quality review. SOPs are detailed in controlled copies of the WSSRAP Procedures Manual (MKF and JEG, 1989). The procedures are reviewed periodically and updated as necessary to record changes in procedures. All manuals are updated and distributed as changes are made.

1.1 PURPOSE

The purpose of this Environmental Data Administration Plan (EDAP) is to identify the approach and conduct of all activities related to the collection, analysis and administration of documentation and data gathered to make environmental decisions at WSSRAP.

The EDAP discusses methods used for acquiring technical data, programs for quality assurance and maintenance of documents and data. The plan establishes a foundation for gathering and examining data prior to its incorporation for use at WSSRAP.

1.2 SCOPE

The EDAP provides guidance on the management of environmental documentation and data resulting from monitoring, surveillance, and characterization at the WSSRAP. All phases of data collection, analysis, and quality are performed as detailed in this plan. This includes sampling plan preparation, data verification and validation, database administration, and data archiving. This plan does not govern worker protection monitoring activities or the quality of data as a result of these activities.

1.3 HISTORICAL OVERVIEW

Analytical data collected from 1987 to 1989 by the Project Management Contractor (PMC) have been managed on an investigation-by-investigation basis. Sampling plans included quality control measures to ensure data integrity. Under the DQO program, data were examined by PMC personnel to test their adherence to PARCC requirements. This review provided a first step to addressing data quality under the DQO program.

While data from 1987 to 1989 were reviewed for PARCC compliance, a separate effort to assess and document the validity of analytical results was also made. The results of this effort are currently being presented in a document scheduled for issue in October 1990: "Data Validation Review."

Data verification and validation programs described in this EDAP were initiated in 1989 for environmental sampling activities. These programs establish additional quality control measures and are detailed in this plan.

1.4 MAINTENANCE

The EDAP will be reviewed annually and revised as necessary to ensure compliance with DOE orders and the overall mission of the WSSRAP. All documents and data will be maintained in accordance with procedures described in Section 4.0 of this plan.

2 DATA COLLECTION

2.1 SAMPLING AND ANALYSIS PLANS

Sampling and analysis plans are developed and prepared for all site activities requiring field collection and laboratory analysis of samples. These plans range in size from one-page memos to multi-paged, self-supporting documents. The plans are activity-specific, describing the objectives and details of the individual sampling efforts and the ultimate uses of the data generated. Sampling and analysis plans specify the types, locations, and frequency of samples to be collected, as well as the sampling protocol and procedures. The plans also detail the specific QA/QC measures to be taken during sampling and analysis effort and reference the requirements of the Quality Assurance Program Plan (QAPP) for the Weldon Spring Site Remedial Action Project (WSSRAP). Sampling plans specify detailed Data Quality Objectives (DQOs) which may take precedence over the standard DQOs.

2.2 SAMPLE COLLECTION AND DOCUMENTATION

Samples are collected using standard operating procedures (SOP) from specific, preplanned locations as detailed in the WSSRAP sampling plans.

Two forms of documentation are used during sample collection to define data reporting requirements that characterize sampling efforts and ensure consistent data records. The field log books are maintained by the field sampling personnel to record details such as dates, times, personnel, weather conditions, deviations from sampling protocol or any other information potentially impacting the specific sampling event. The level of detail should be sufficient to

understand and re-create the activity at a later date, even in the absence of the field personnel.

The sampling field data form is completed for each sample location at the time of sample collection. These forms are specific to the common types of samples collected at the WSSRAP, i.e., soils, groundwater, surface water, etc. The field sampling forms record the sample identification numbers assigned to the sample collected based on location and date (SOP ES&H 4.1.1). This unique ID number is used throughout documentation and reporting of data. The forms also initiate the tracking of laboratory performance and evaluation of data quality. Additionally, these forms document that field personnel collected samples in accordance with WSSRAP procedures, preserved samples properly, and collected QA/QC samples, and other vital information. An example of a typical sampling field data form is shown in Figure 2-1.

2.3 CHAIN-OF-CUSTODY

Sample custody is an integral part of quality and field laboratory operations. Sample possession must be traceable from the time each is collected until it is disposed of or placed in final storage. A sample is under custody if one or more of the following criteria are met:

- the sample is in the actual possession of the responsible party
- the sample is in the view of the responsible party, after being in possession
- the sample was in the responsible party's possession and then that person locked it up or sealed it to prevent tampering

WELDON SPRING SITE REMEDIAL ACTION PROJECT (WSSRAP)
7295 Highway 94 South, St. Charles, MO 63303
Telephone (314) 441-8080 Telecopy (314) 447-0803

GROUNDWATER SAMPLING FIELD DATA FORM 4.4.1.1

WELL #: MW-2010 DATE: MAY 4, 1990 SAMPLE ID#: GW-2010-QZ90
PERSONNEL: JWD

TIME

0810 Well secure: (yes) no Total depth: 79.10 ft.

0812 Static water level: 53.42 ft.
Length of water column: 25.68 ft.
Diameter of well: (2") 4", or 6"
Volume of water column:
16L for 2", .65L for 4", 1.5L for 6" 4.1 gal.

0822 Begin evacuation Method: DEDICATED PUMP (BLADDER)
Rate of recharge: v. slow, (slow) mod. fast, or v. fast

0930 Number of volumes removed: 3+ (14.5 GAL)

0935 Temperature: 12.4 C Instrument used:
pH: 6.89 Ø11
Conductivity: 540 RC-16C
Water conditions: CLEAR

1005 Completed sampling Method: SAME AS ABOVE

1007 Temperature: 12.6 C Instrument used:
pH: 6.77 Ø11
Conductivity: 525 RC-16C

1012 Final water level: 68.44 ft.
Comments/Duplicates:
TOOK DUPLICATE ⇒ GW-2110-QZ90

Parameters collected: NAT. URANIUM, NITROAROMATICS
Samples filtered: yes no
Samples preserved: X Radiological pH<2 (HNO_3)
___ Metals pH<2 (HNO_3)
X Others packed in ice

FIELD DATA FORM

FIGURE 2-1

REPORT NO.: DOE/OR/21548-119	DRAWING NO.: A/PI/001/0490	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 4/90

- the sample is in a designated and identified secure area under control of the ES&H Department.

All samples are collected according to SOPs for the particular sample type. The field personnel are responsible for the collection, care and custody of the sample until the sample is properly transferred or dispatched. An Environmental Chain-of-Custody form (Figure 2-2) is completed for each sample or group of samples. The Chain-of-Custody (COC) form includes sample identification numbers, number of containers, sample matrix, analytical parameters requested, turnaround time required, samplers' signatures and a section for tracking sample possession.

When the samples are shipped to the lab for analysis the individuals relinquishing and receiving the samples sign, date, and note the time and reason for transfer on the COC. The completed original form is then placed inside the shipping container. The laboratory documents receipt of the samples on the COC and notify the shipper and the WSSRAP in the event that samples are damaged, tampered with, or missing.

Corrections necessary in completing COC forms are made by a single strike-mark through the error. The person making the correction initials and dates each correction.

2.4 REQUEST FOR ANALYSIS

Samples collected in the field commonly require analysis by an off-site laboratory subcontracted by the WSSRAP. In order to authorize testing on the samples, PMC personnel complete a Laboratory Services Authorization Form. These forms are specific to each sample matrix (i.e., water, soil, etc.). They include such information as laboratory name, sample identification numbers, number of containers, analytical

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A MORRISON KNUDSEN COMPANY

WELDON SPRING SITE REMEDIAL ACTION PROJECT (WSSRAP)
7295 HIGHWAY 94 SOUTH
ST. CHARLES, MO 63303

TELEPHONE (314) 441-8086 TELEX (314) 447-0803

ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY FORM

WSSRAP CONTRACT: _____ REQUEST NO: _____

PHONE EXT.: _____ DATE SAMPLED: _____ LABORATORY RECEIVING SAMPLES: _____

SAMPLE NUMBER	NO. OF CONT.	MATRIX	PARAMETERS	PRESERVATIVES

SAMPLERS' SIGNATURE: _____

RELINQUISHED BY	RECEIVED BY	DATE	TIME	REASON FOR TRANSFER	SEAL INTACT (YES/NO)	COOLER TEMP.

ENVIRONMENTAL CHAIN OF CUSTODY FORM

FIGURE 2-2

REPORT NO.: DOE/OR/21548-119	DRAWING NO.: A/PI/027/0590	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 5/90

parameters, turnaround time requested and required number. The Laboratory Services Authorization Forms authorize analytical service and provide a mechanism for tracking analytical laboratory budgets and performance. An example form is presented in Figure 2-3.

2.5 SAMPLE SHIPMENT

Samples are packaged and shipped to analytical laboratories in accordance with WSSRAP standard operating procedures. These procedures detail the requirements of packaging and shipping for common types of samples in order to protect the samples during shipment. All samples shipped off-site are accompanied by a Shipping Order Form (Figure 2-4). This form is completed by the Subcontract Administrator when the Chain-of-Custody and Laboratory Services Authorization Forms are reviewed and approved. These three forms are combined, placed in a plastic bag, and accompany the sample being shipped.

2.6 SAMPLE TRACKING

Sample shipments to analytical laboratories are inventoried and controlled by the use of a laboratory contract request number. When a sample shipment is made, sample information from the documentation is entered into a computerized database, the Environmental Sample Tracking (EST) system.

EST allows timely inventory of the status of analytical samples from collection through receipt of data results. The EST system also serves an accounting function by calculating analytical costs, assists in invoice payment authorization and provides budget reporting.

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WSSRAP
7295 HWY 94 South
St. Charles, MO 63303
(314) 441-8086

WATER ANALYSIS

Page 1 of 1

LABORATORY SERVICES AUTHORIZATION FORM

Lab: ABC
Requisitioner: JOHN DOE
Cost Code: EMP
Need Date: 6/1/90
Request No: 32
Dept: ES&H
P.O. No: 3589-1002-00001
C.O.C. No: ____

___ Emergency ___ Urgent
___ Priority X Standard

Sample Id.	Containers	Matrix
GW-2010-Q290	2	GROUNDWATER
GW-2110-Q290	2	"

Authorization:
William Wilkinson 5/4/90
MK-F Procurement Date

John W. Doe 5/4/90
ES & H Date

Shipping: Initial _____ Date: _____

Receiving: Initial _____ Date: _____

PRIMARY ANALYSES

___ [101] Charge Mass Balance
___ [102] Chromium, Hexavalent
___ [103] Chromium, Trivalent
___ [104] Dioxins, Class Specific
___ [105] HSL Metals + Lithium +Mo
___ [106] Nitroaro., GC/MS
___ [107] Nitroaro., Modi. Usathame
X [108] Nitroaro., Usathame
___ [109] NO3,Cl,SO4,F
___ [110] Oxygen Demand, Chemical
___ [111] PCB's
___ [112] pH
___ [115] TCL Semi-Volatile Orgs
___ [116] TCL Volatile Organics
___ [117] Total HSL
___ [118] Total Organic Carbon
___ [119] Total Suspended Solids

RADIOCHEMICAL

___ [201] Gross Alpha
___ [202] Gross Beta
___ [203] Isotopic Actinium
___ [204] Isotopic Radium
___ [205] Isotopic Thorium
___ [206] Isotopic Uranium
___ [207] Lead - 210
___ [208] Polonium - 210
___ [209] Radium - 226
___ [210] Radium - 228
___ [211] Thorium - 230, 232
X [213] Uranium-Natural

___ [321] Extraction, EP Toxicity
___ [323] Extraction, TCLP
___ [113] Sample Filtration
___ [114] Sample Preservation
___ [120] NPDES Quaterly Analysis
___ [121] NPDES Annual Analysis
___ Metals Analysis Attachment

SECONDARY ANALYSES

___ [301] 2378 TCDD
___ [302] Acidity, Total
___ [303] Alkalinity, Total
___ [304] Arsenic
___ [305] Ash Content
___ [306] Bacteria, Fecal Coli
___ [307] Bacteria, Fecal Strep
___ [308] Bacteria, Total Coli
___ [311] Bromide
___ [312] BTU Value
___ [314] Chlorine
___ [316] Corrosivity
___ [317] Cyanide
___ [318] Cyanide Reactive
___ [319] Cyanide Total
___ [326] Hardness
___ [331] Nitrate
___ [332] Nitrite
___ [334] Nitrogen, Ammonia
___ [335] Nitrogen, Ejeldahl
___ [336] Nitrogen, Organic
___ [337] Oil & Grease (TCTFE)
___ [338] Organic Halide, (TOX)
___ [339] Oxygen Demand, Biochem
___ [340] Phenols
___ [341] Phosphorus, Ortho
___ [342] Phosphorus, Total
___ [343] Solids, Volatile
___ [344] Specific Gravity
___ [346] Sulfide Reactive
___ [347] Sulfide Total
___ [348] Sulfite
___ [349] Sulfur Content
___ [350] TCL Peeticides/PCB
___ [351] TDS
___ [352] Turbidity (J.T.U.)
___ [353] Viscosity
___ [354] Zirconium

LABORATORY AUTHORIZATION FORM

FIGURE 2-3

REPORT NO.: DOE/OR/21548-119		DRAWING NO.: A/PI/003/0490	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 4/90	

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

NO. 5000

SHIPPING ORDER

SHIPPED TO
ABC LABS INC.
1234 INDUSTRIAL DR.
WELDON SPRING, MO 63303
ATTN: JOE DUPONT
1-919-323-4001

SHIPPED FROM
CONTRACT NO 00001
LOCATION W.S.P.
DATE SHIPPED 5/4/90
PURPOSE OF SHIPMENT
SALE ☐ TRANSFER ☒
RETURN FOR CREDIT ☐
FOR REPAIR ☐
OTHER
00001-00001
P. O. NO. ASSIGNED

SHIPPED VIA FEDERAL EXP.
B. L. NO. DATE 5/4/90 PREPAID ☒ COLLECT ☐

QUANTITY	UNIT	DESCRIPTION	SERIAL NO. OR SPECIAL MARK
		REQUEST # 32	
1	COOLER	CONTAINING FOUR(4) SAMPLES FROM TWO(2) IDENTIFICATION NUMBERS	
		★ STANDARD TURNAROUND	

CLAIMS FOR SHORTAGES MUST BE MADE WITHIN 10 DAYS

SHIPMENT OF ITEMS LISTED ABOVE WERE MADE IN THE MANNER NOTED.
William Williams
WAREHOUSEMAN

SHIPMENT OF ABOVE ITEMS FOR PURPOSE DESIGNATED IS HEREBY APPROVED
Bill Thompson
PROJECT MANAGER WAREHOUSE MANAGER

FORM WH115 Rev 5-82

SHIPPING ORDER FORM

FIGURE 2-4

REPORT NO.: DOE/OR/21548-119	DRAWING NO.: A/PI/004/0490	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 4/90

3 DATA QUALITY

All data and documentation from sampling activities are reviewed under Environmental Data Administration Plan (EDAP) data quality programs. Data received from analytical laboratories are also reviewed for completeness and quality. The data quality programs, data verification and data validation examine documents and data prior to its use at WSSRAP.

3.1 DATA VERIFICATION PROGRAM

The verification program is primarily designed to ensure that documentation and data are reported in compliance with established Data Quality Objectives (DQOs) and Standard Operating Procedures (SOPs) and to evaluate the completeness of data. The Data Verification Program consists of six verification tests Two tests are associated with data delivery and analytical costing. Four tests compare actual procedures to Weldon Spring Site Remedial Action Project (WSSRAP) DQOs, analytical protocol and SOPs. Elements reviewed are sample preservation and identification, Chain-of-Custody (COC) completion, analytical hold times, and data review. The results of the verification tests are documented with a verification checklist (Figure 3-1).

3.1.1 Data Delivery

Delivery of analytical data is tracked to ensure that the requested laboratory services are performed in an accurate and timely manner.

Analytical results are delivered in two formats: a formal report with QA/QC paperwork and an electronic copy. Current contracts with two analytical laboratories require delivery only

WELDON SPRING SITE REMEDIAL ACTION PROJECT (WSSRAP)
VERIFICATION CHECKLIST
FORM 4.9.1.2

Request Number:_____
Date Sampled:_____
Date Shipped:_____
Date laboratory received samples:_____
Date WSSRAP received analytical results:_____
Turnaround time requested: ___S(28 days) ___P(14 days)
___U(5 days) ___E(48 hrs.)
Were turnaround times met? ___yes ___no If not, specify/explain:
_____
Laboratory name:_____
Sample ID numbers:_____
_____
_____
Parameters requested:_____
_____
_____
_____
_____
Samples preserved and labelled at WSSRAP according to applicable procedure:
___yes ___no
Chain of custody completed according to established procedure:
___yes ___no
Extraction holding times met? ___yes ___no
Comments:_____
_____
Analytical holding times met? ___yes ___no
Comments:_____
_____
Data reviewed by:_____

Verification Checklist completed by:

_____ _____
Signature Date

DATA VERIFICATION CHECKLIST

FIGURE 3-1

REPORT NO.: DOE/OR/21548-119	DRAWING NO.: A/PI/005/0490	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 4/90

of formal analytical reports. Future laboratory service contracts will require delivery of data in both formats.

Analytical results from subcontract laboratories are received at WSSRAP and are logged and dated by the Project Management Contractor (PMC) Subcontract Administrator. All analytical results are forwarded to the PMC Data Administration Section. The receipt of data is recorded in a manual sample tracking log.

The data formats are reviewed to determine if all formats have been received according to contract requirements. In addition, data are reviewed to confirm that all parameters are received for the analytical tests. If additional data are required to complete the laboratory request, a discrepancy form (Figure 3-2) is completed and sent to the Subcontract Administrator for handling.

As discussed in Section 2.4, when samples are shipped, a lab authorization form is completed. The laboratory authorization form indicates a turnaround time for delivery of analytical results. The standard turnaround time is 28 calendar days.

Analytical services are also available within premium turnaround times ranging from 48 hours to 2 weeks. These services are usually reserved for special sampling events or National Pollutant Discharge Elimination System (NPDES) monthly reports.

When the data are received by the PMC, the date is recorded on the laboratory report. This date is compared with the shipping date for the sample to determine a total turnaround time. If a turnaround time is greater than the requested time, a verification discrepancy form is completed to record the

VERIFICATION DISCREPANCY DOCUMENTATION
FORM 4.9.1.4

Date:_____

WSSRAP Sample ID:_____

Laboratory performing analysis:_____

Laboratory ID:_____

Describe discrepancy:_____

_____

_____

_____

_____

Corrective Action Taken:_____

_____

_____

_____

_____

Signature:_____ Date:_____

VERIFICATION DISCREPANCY FORM

FIGURE 3-2

REPORT NO.:	DOE/OR/21548-119	DRAWING NO.:	A/PI/006/0490		
ORIGINATOR:	JMH	DRAWN BY:	GLN	DATE:	4/90

turnaround time. The potential effects of negligence in meeting turnaround times may include failure to comply with analytical hold times on analyses.

3.1.2 Sample Preservation and Identification

Documents prepared during sample collection are reviewed to verify compliance in identification and preservation of samples. According to procedures, consistent numbering of sample location is necessary for sample identification. Sample IDs are checked for proper use of sample type identifiers, location number/coordinates, date codes and QA/QC coding.

Preservation of samples is required under certain analytical methods. Sample preservation required prior to shipment is documented on field data forms. The forms are reviewed for completeness and accuracy in preservation during the verification tests.

3.1.3 Chain-of-Custody

Copies of COC records are returned to the PMC with the analytical results. The COC records are reviewed for compliance with procedures as described in EDAP Section 2.3 and WSSRAP SOPs. The COC is reviewed for possession and signatures status of the samples, for any samples that may have been damaged, and for clarity of information provided on the COC form.

3.1.4 Analytical Holding Times

WSSRAP DQOs incorporate analytical methods under U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) protocol. These methods designate maximum analytical holding times, the period between sample collection

and analysis. Some methods also specify extraction procedures and extraction holding times.

When analytical results are received, the date of extraction and date of analysis for each analyte is reported. The extraction and analysis dates are compared with the sample collection date to determine total holding time for the sample. The sample's holding time is compared to the holding time for the analytical method as defined by the WSSRAP DQOs. Holding times are recorded for each analysis. A discrepancy form is completed for sample holding times that exceed DQO protocol.

3.1.5 Data Review

All analytical data are reviewed as a final verification test. The data review process evaluates comparability of sample data with other previously reported concentrations for the sample location. Sample data is also compared to the QA/QC samples, field blanks, and laboratory duplicate samples collected on the same sample date. The data review reports inconsistencies in concentrations, sampling procedure, sample identification, etc.

The data review form (Figure 3-3) is completed by the PMC personnel. The data reviewer will designate the data as "acceptable" or "unacceptable" and include qualifying comments on the data review sheet for all data designated as unacceptable. Unacceptable data will be considered for data validation activities as presented in Section 3.2.

3.1.6 Verification Documentation

The verification checklist is completed by the Data Administration Section based on results of each verification

WELDON SPRING REMEDIAL ACTION PROJECT (WSSRAP)

DATA VERIFICATION DATA REVIEW SHEET
FORM 4.9.1.1

Laboratory:_____

Request Number(s):_____

_____

Date Received:_____

Reviewer(s):_____

Review Date:_____

Data is: Acceptable:____ Unacceptable:____

Comments:_____

_____

_____

_____

_____

Signature:_____

Date Returned:_____

REVIEWER: THIS SHEET SHOULD BE RETURNED TO THE VERIFICATION DEPARTMENT WITHIN 2 WORKING DAYS OF DATE RECEIVED.

DATA REVIEW FORM

FIGURE 3-3

REPORT NO.: DOE/OR/21548-119	DRAWING NO.: A/PI/007/0490	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 4/90

test. Overall integrity of the data is measured and documented with the verification checklist.

All data will be assigned a verification status code of A (approved) or S (significant). If no discrepancies exist from the verification review, a status of A, approved will be assigned to the data. If significant discrepancies exist, such as samples that exceed holding times, a status code of S will be assigned to the data. Data with a status code of S will be considered for validation review as part of the non-random data validation program that is further detailed in Section 3.2.

All data regardless of status code will be considered available for use by WSSRAP. The verification status does not disqualify data from use. The verification tests are used to determine compliance with WSSRAP DQOs and SOPs and prequalify sample data for data validation review.

3.2 DATA VALIDATION

Data validation is the process of reviewing the analytical data, using laboratory records, to assess laboratory performance as compared to quality control (QC) criteria, data quality objectives, and procedural requirements. The purpose of validation is to document the quality and usefulness of the data and documentation developed during sample analysis.

The validation of data is divided into the following three tasks: (1) identification of data to be validated, (2) actual validation, and (3) documentation. These tasks are discussed in the following sections.

3.2.1 Identification

The identification of data to be validated is accomplished in two ways. The first consists of routine validation. Approximately 5% of the samples collected will be validated as soon as the analytical data is received from the lab. These data points are identified in the sampling plans that detail their collection. An additional 5% of the data will be selected following completion of the data review portion of the verification process. Additional data points may be identified for validation based on the criticality and sensitivity of the data. For example, data that contribute to risk assessments or final remedial action decisions may be identified for validation. Requests for validation are made on data validation request and tracking log forms (Figure 3-4).

3.2.2 Validation

The actual data validation process is detailed in an Engineering SOP (ENG-9). This process consists of reviewing and evaluating the data resulting from laboratory analyses. The review consists of two phases. The first deals with the analytical process itself. Laboratory analytical records are reviewed and evaluated to assure compliance with the procedures governing the analysis. These records may include but are not limited to: sample custody records, sample preparation logs, instrument printouts, calibration checks, initial calibration data, etc.

The second phase of the data validation process consists of evaluating the data for precision, accuracy, and completeness. Precision, accuracy and completeness are evaluated by comparing the data to data quality objectives in sampling plans.

CONTROL NO: _____

DATA VALIDATION REQUEST FORM

REQUESTOR: _____

WBS CODE: _____

DEPARTMENT: _____

DATE: _____

USE ONE FORM PER LABORATORY. LAB NAME: _____

REQUEST NO: _____

SAMPLES RECOMMENDED FOR VALIDATION:

WSSRAP ID	LAB ID	SAMPLE DATE	PARAMETER	FOR REVIEW USE

FOR REVIEW USE:

DATE REC'D: _____

SUBMITTED TO VALIDATION: _____

DATE OF REQUEST TO LAB: _____

DATE COMPLETED: _____

VALIDATION REQUEST FORM

FIGURE 3-4

REPORT NO.: DOE/OR/21548-119			DRAWING NO.: A/PI/026/0590		
ORIGINATOR: JMH		DRAWN BY: GLN		DATE: 5/90	

The primary end result of the validation process is a qualifier which denotes the quality of the data point. These qualifiers range from "acceptable with no limitations" to not acceptable. This qualifier enables data evaluation personnel to incorporate data quality into interpretations. A list of data qualifiers is shown in Figure 3-5.

3.2.3 Documentation

Data validation activities will be recorded in several documents. These documents include a detailed validation checklists specific to analysis. An example of validation documentation for a semi-volatiles analysis is shown in Appendix B. Data validation summary reports will be generated for each validation request and will provide information substantiating the assignment of qualifiers.

As a result of validation activities, at least 10% of the WSSRAP data will be directly validated (validation that results out of a specific request from data users). However, for some analyses, a portion of the database will also be validated indirectly (or "by association") as a consequence of the "sample batching" nature of most analytical procedures. Such indirect validation is possible for most metals analyses, most miscellaneous inorganic analyses, some anions, and some radiological procedures since the data documentation for these analyses is typically presented for the entire analytical batch or lot (which may include WSSRAP samples that were not specifically requested for validation).

DATA VALIDATION QUALIFIER LIST

QUALIFIER	PURPOSE
Primary	
N	Sample not scheduled for data validation
P	Data validation in Progress (Pending)
A+	Data useable; no further qualifiers
A[*]	Data useable; with qualifiers
R[*]	Data Rejected; with explanation
O[**]	Data validation ON-HOLD (additional info requested from lab)
Secondary *	
>	high bias
<	low bias
L	Lab Control Sample (LCS) outside acceptance range (accuracy)
B	Blank contamination (integrity)
M	MS/MSD outside acceptance range (accuracy/precision)
D	Dup. Relative % Difference outside acceptance range (precision)
S	Surrogates outside acceptance range (accuracy)
I	Internal Standards (GC/MS) outside acceptance range (quantification)
H(#/#)	Holding times exceeded (integrity)
C	Calibration criteria not met (quantification)
T	GC/MS Tune criteria not met (qualification)
F	Interferences present (matrix related)
?	Other (see data validation notes)
J	Estimated value
Y	Shipping delay to lab (greater than 1 day)
G	Typographical error (significant)

Tertiary **

c	calibration	i	instrument printouts
s	sample preparation	l	control charts
t	tune	d	data summary sheets
q	QC samples/information	n	notebook entries
u	custody transfer record	e	corr. action/exception reports
p	standards preparation	?	other (see data validation notes)
m	mass spectra		

EXAMPLES:

A[L>,H(5)] - means the data point is useable, but the value may be slightly high (per the LCS); and the holding time was exceeded by 5 days.

A[F,J] - means the data point appears useable, but there are sample-related interferences present that resulted in an estimated value.

R[S<] - means the data are not useable because the surrogate recoveries were too low to rely on the value.

P - means this sample/analyte is scheduled for data validation, but the validation tasks are not yet complete.

DATA VALIDATION QUALIFIERS

FIGURE 3-5

REPORT NO.: DOE/OR/21548-119		DRAWING NO.: A/PI/028/0590	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 5/90	

4 DATA ADMINISTRATION

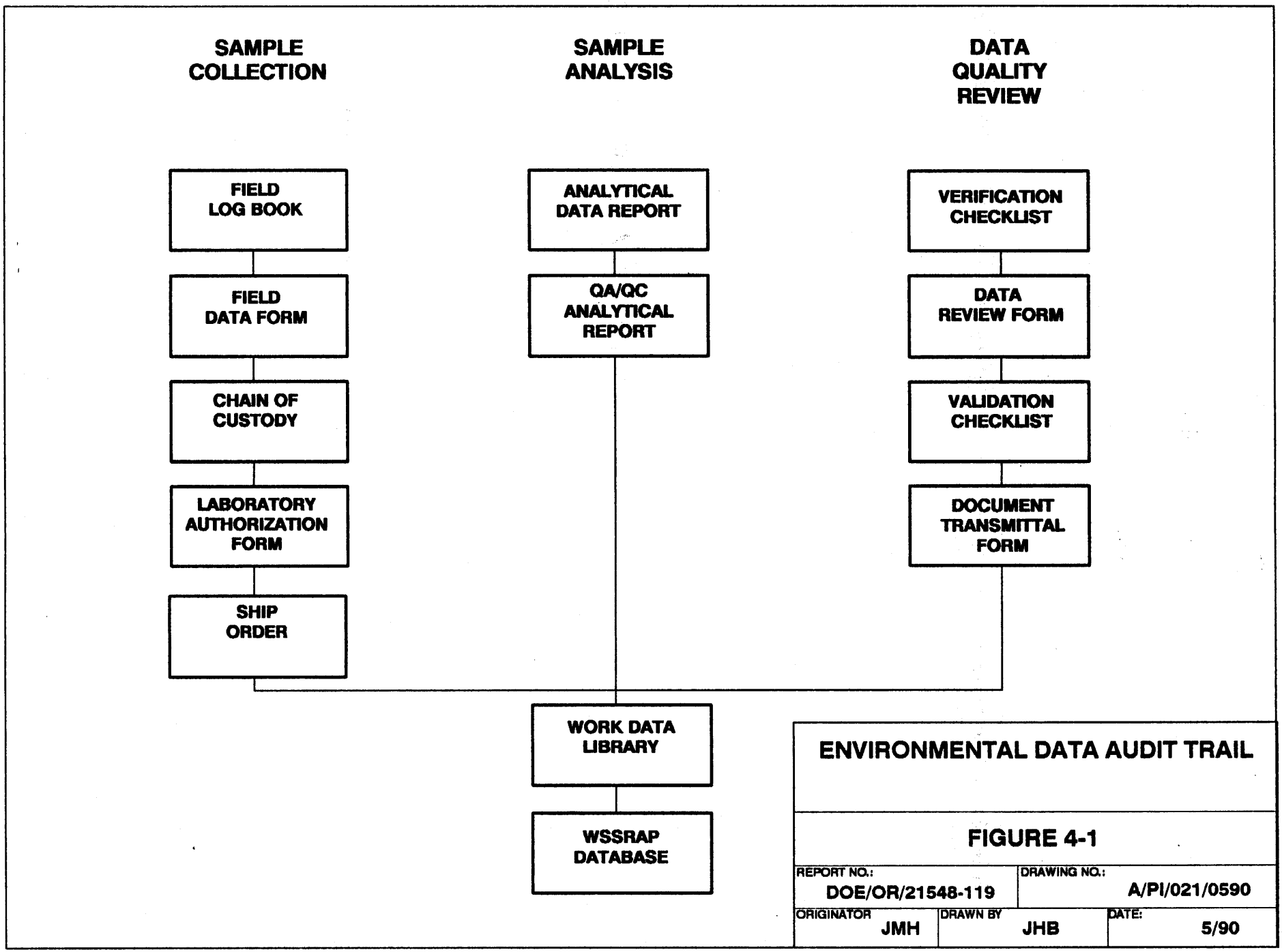
All documentation and data generated through the environmental monitoring activities are managed and maintained by the data administration plan of the Environmental Data Administration Plan (EDAP). Each document created from sampling to data quality review provides information and support for environmental decisions at Weldon Spring Site Remedial Action Project (WSSRAP). The standardization of forms and documents as directed by Standard Operating Procedures (SOPs) provides a source of information that is complete yet unique for each sample. The full set of data and documents is termed the data audit trail. Figure 4-1 summarizes the data and documentation in the audit trail. The administration of data includes the maintenance of all documents and data in the audit trail, providing the information to WSSRAP in an organized, flexible manner and incorporating a system to archive data.

In this discussion of data administration plans, all environmental data and documentation from sampling, analysis and quality review programs are collectively referred to as records.

4.1 RECORD MAINTENANCE

Environmental records are maintained in two formats: hard copy records and electronic records. Hard copy records include all documents and data preserved in written, typed or instrument-printed form. All environmental records originate in hard copy format.

Electronic records are defined as computerized records of environmental data. Currently, only analytical data are maintained in electronic format. Approximately 60% of the subcontract laboratories transcribe analytical reports into electronic format. Analytical results not reported in



ENVIRONMENTAL DATA AUDIT TRAIL

FIGURE 4-1

REPORT NO.:	DRAWING NO.:	
DOE/OR/21548-119	A/PI/021/0590	
ORIGINATOR: JMH	DRAWN BY: JHB	DATE: 5/90

electronic format are transcribed to electronic records by the Project Management Contractor (PMC).

4.1.1 Hard Copy Records

All original records are received by the PMC. When the original is received, a copy of the document is made. A copy of the record is filed in the Work Data Library.

The Work Data Library is a centralized library system that contains all documents and data from environmental monitoring activities. The library is primarily organized by record type: data or documentation. Each record type is then classified and filed according to sample type. Sample types were mentioned in Section 2.1 as a manner in which to assign sample identification numbers. Functionally, sample types also form the basis for data interpretation and, therefore, sample types are used in record management. Table 4-1 lists the sample type categories in use.

When a record is submitted to the library files, it is assigned an index number based on record and sample type number. An example of the index record number is ES-19-01-02. The first four characters (ES-19) identify the document as an environmental record. The fifth and sixth digits (01) designate the record as analytical data. The seventh and eighth digits (02) designate the sample type as surface water. A current Work Data Library index is presented in Table 4-2. The index is updated periodically to incorporate new records.

When record copies are made for the Work Data Library, the originals are forwarded to Quality Assurance for secured storage. An internal document transmittal form is completed to accompany the document transfer (Figure 4-2). All original

TABLE 4-1 WSSRAP Environmental Data Sample Type Categories

AA	Ambient Air
AP	Air Particulate
BA	Bulk Asbestos
BG	Biological
BZ	Breathing Zone
IN	Insulation
LY	Lysimeter
MW	Monitoring Well
NP	NPDES
OT	Industrial Hygiene
PZ	Piezometer
RD	Radon Cup
RS	Radiation Safety
SD	Sediment/Sludge
SO	Soils Phase I
S2	Soils Phase II
SW	Surface Water

TABLE 4-2 Work Data Library Index

ES-19-01	TECHNICAL DATA
ES-19-01-01	Groundwater Data
ES-19-01-02	Surface Water Data
ES-19-01-03	Spring/Seep Data
ES-19-01-04	Radon Data
ES-19-01-05	TLD Data
ES-19-01-06	NPDES Data
ES-19-01-07	Industrial Hygiene Data
ES-19-01-08	Radiation Lab Data
ES-19-01-09	Air Particulate Data
ES-19-01-10	Sludge Data
ES-19-01-11	Sediment Data
ES-19-01-12	Soils Data
ES-19-01-13	Biological Data
ES-19-02	QUALITY ASSURANCE
ES-19-02-01	metaTRACE QA Reports
ES-19-02-02	Acculab QA Reports
ES-19-02-03	JTC QA Reports
ES-19-02-04	Inhouse Calibration Records
ES-19-02-05	AEHA QA Reports
ES-19-02-06	IT QA Reports
ES-19-02-07	Other Labs QA Reports
ES-19-02-08	Training Records
ES-19-02-09	Document Transmittal
ES-19-02-10	Audits/Reviews/Performance
ES-19-03	DOCUMENTATION
ES-19-03-01	Field Sheets
ES-19-03-02	Log Books
ES-19-03-03	Chain of Custody Records
ES-19-04	CORRESPONDENCE - REPORTS & LETTERS
ES-19-04-01	DOE/PMC Correspondence
ES-19-04-02	Laboratory Correspondence
ES-19-04-03	EPA Correspondence
ES-19-04-04	USGS
ES-19-04-05	MoDNR
ES-19-04-06	SCCAHW
ES-19-04-07	DOE/PMC Reports
ES-19-05	DATA VERIFICATION RECORDS
ES-19-05-01	Data Review Sheets
ES-19-05-02	Verification Checklists
ES-19-05-03	Verification Summaries
ES-19-05-04	Discrepancy Forms

MK-FERGUSON CO.
A MORRISON KNUDSEN COMPANY

INTERNAL DOCUMENT TRANSMITTAL

BBERAP-IDT-9-89

TRANSMITTAL NO.		
WORK PKG NO.	CONTRACT NO. 3589	DATE
TO.	FROM	
ATTENTION	SIGNATURE	

ACTION REQUESTED:	STATUS	
	APPROVED - FOR CONSTRUCTION	A
	DISAPPROVED - REVISE AND RESUBMIT	D
	APPROVED WITH COMMENTS - FOR CONSTRUCTION	E

PROCEDURE, SPECIFICATION, DRAWING OR ITEM NUMBER	REV NO.	NO. COPIES	TITLE OR DESCRIPTION	STATUS

ADDRESSEE:

RECEIPT ACKNOWLEDGEMENT REQUIRED ☐
PLEASE RETURN ONE COPY OF THIS TRANSMITTAL TO DOCUMENT CONTROL WITHIN ___ WORKING DAYS

RECEIPT ACKNOWLEDGEMENT NOT REQUIRED ☐

THE ABOVE LISTED DOCUMENTS HAVE BEEN RECEIVED BY:

SIGNATURE

DATE RECEIVED

INTERNAL DOCUMENT TRANSMITTAL FORM

FIGURE 4-2

REPORT NO.: DOE/OR/21548-119	DRAWING NO.: A/PI/009/0490	
ORIGINATOR: JMH	DRAWN BY: GLN	DATE: 4/90

documents are inventoried by Quality Assurance and stored in fireproof safes at the WSS.

4.1.2 Electronic Records

Electronic records are maintained in a computerized database system termed the WSSRAP database. The WSSRAP database is a microcomputer based system utilizing dBASE III Plus software. Analytical records are organized into database files by sample type such as groundwater. The database files contain in database fields specific information on the sample. The fields maintained in the WSSRAP database include sample identification number, sample date, analytical date, parameter, etc. The list of all database fields and a description of field information is presented in Table 4-3.

Analytical results reported by the subcontract laboratory in electronic format are submitted on a 5 1/4" floppy diskette. Each diskette contains a dBASE III Plus file recording specific sampling information. The diskette is received by the PMC and copied to the WSSRAP database during verification tests. After the disk transfer is completed, a control number is assigned to each diskette and recorded on a disk record log maintained by the PMC. All diskettes are filed in a fireproof safe located at the WSS.

4.2 RECORD USE

The Work Data Library and the WSSRAP database provide an centralized source for information to be used in preparing environmental reports and remedial action alternatives. The environmental records are organized to provide data that are readily retrievable and convenient for use. Environmental records are required for use by on-site and off-site personnel.

TABLE 4-3 WSSRAP Environmental Database Fields

Field	Description of Information
WSSRAP ID	Sample identification number
Lab ID	Analytical laboratory identification number
Sample Date	Date of sample collection
Matrix	Sample type
Category	Compound or group of parameters analyzed
Parameter	Compound analyzed - chemical or radiological
Concentration	Identified amount of parameter
Units	Standard of measurement of parameter analyzed
Error	Range of error in measurement of concentration. Used mainly in radiological analyses.
Analysis Date	Date of analysis of sample
Extraction Date	Date of sample extraction if applicable under analytical method
Method	Analytical method used by laboratory in analysis of sample
Detection Limit	Minimum reportable concentration of compound defined by data quality objectives
Verification	Verification code assigned reflecting analytical status of sample
Qualifier	Validation code assigned to sample reflecting usability of data

4.2.1 Use of Work Data Library

The Work Data Library is located at the WSS. All personnel have full access to records in the library for use and/or copying. Personnel requiring use of records must sign the documents out on a library log maintained by the PMC to record such use of records. A maximum check-out period of one day is allowed and only on-site use of records is permitted. The Data Administration Section manages the use of the Work Data Library.

4.2.2 Use of WSSRAP Database

The electronic record database is more widely used for review of analytical data by WSSRAP personnel. Database use is managed by a customized software program called the Generic Universal Report Utility (GURU). The GURU program was developed by the PMC for use in accessing the WSSRAP database. GURU is a compiled dBASE program written for the IBM PC network system.

The GURU program provides a tool for easy and flexible access to data records. The GURU is also defined as a data extraction program since data can be selected and sorted based on sample identification number, parameter or any other field definition. Selected data can be extracted or copied to other computerized formats or as a printed report.

The GURU program also provides a method to secure data contained in the WSSRAP database. Data are made available to the user without risking the integrity of the data. Users are allowed to view or copy records, but records cannot be modified or deleted within the GURU system.

On-site use of the WSSRAP database is provided by accessing the WSSRAP local area network system. Users requiring access to the database must complete a user registration form with the PMC

Management Information System (MIS) Coordinator. A user name and password is assigned to each user and specifies access to the WSSRAP database and GURU system.

Off-site use of the WSSRAP database and the GURU system is available for WSSRAP participants. Access to the database will be provided by a modem connection. The modem capability allows off-site users to dial in on standard phone lines and connect to a computer at the WSS. The modem connection allows the same convenience and security features of on-site use. Off-site users requiring access to the database must complete a users' registration form with the PMC MIS Coordinator. A user name and password is assigned to each user and off-site access may be specified.

4.3 DATA ARCHIVING

A system of archiving environmental data is necessary due to the volume of data and duration of WSSRAP. Formats of data documentation -- hard copy, originals, and electronic -- will be archived. Archiving of data will be allowed only after all EDAP data quality activities have been completed on the data to be archived. Specifically the data must be verified and validated under the EDAP program.

All original documents are transferred to Quality Assurance and are archived under DOE contract requirements. The original documents are stored in the WSSRAP Quality Control area in a fireproof safe. The original documents will be maintained by Quality Control for the duration of the project. Work Data Library and Electronic data records are maintained by the Data Administration sections. These records will be archived. Archival of records is performed annually.

Work Data Library documents will be inventoried and will be boxed and stored at WSSRAP for a one-year period in archive status. After one year in archive, the Work Data Library documents will be destroyed.

Electronic data records will also be archived after five years. All archive data will be transferred to new historic data record files. The archive files will be backed up with magnetic tapes and stored in the fireproof safe in Quality Assurance. The archive data files will be available for use by the WSSRAP GURU program but not in conjunction with active data files. Original electronic data reporting disks from the laboratory will be destroyed after five years.

5 REFERENCES

MK-Ferguson Company and Jacobs Engineering Group, 1990a. Environmental Monitoring Plan, Weldon Spring Site. Revision 1. DOE/OR/21548-103. February.

MK-Ferguson Company and Jacobs Engineering Group, 1990b. WSSRAP Quality Assurance Program Plan, Revision 2. St. Charles, Missouri.

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MK-Ferguson Company and Jacobs Engineering Group, 1989. WSSRAP Procedures Manual, Environmental, Safety and Health. St. Charles, MO. May.

Meyer, K., 1989. MK-Ferguson Company Interoffice Correspondence from Ken Meyer to Distribution, dated 01/25/90. Subject: Data Quality Objectives - Past and Present.

U.S. Environmental Protection Agency, 1987. Data Quality Objectives for Remedial Response Activities - Development Process. EPA 540/6-87/003. March.

APPENDIX A
Data Quality Objectives

Specific Data Quality Objectives (DQOs) for the Weldon Spring Site Remedial Action Project (WSSRAP) have been developed according to the U.S. Environmental Protection Agency (EPA) Guidance Document. These site-specific DQOs include Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC) goals for future data collection activities. Each of these goals is discussed in the following paragraphs.

PRECISION AND ACCURACY

Precision and accuracy goals for analytical data are presented in the following table. Analytical methods, detection limits and precision and accuracy goals are presented by analytical parameter and media for both soil and water. Generic precision and accuracy goals are also presented.

REPRESENTATIVENESS

The representativeness of data collected will be ensured by proper selection of sampling locations and by ensuring that Standard Operating Procedures are followed during sample collection.

COMPLETENESS

Completeness is the percentage of measurements that are valid. The goal for completeness at the WSSRAP is 85%.

COMPARABILITY

By establishing precision and accuracy goals and monitoring analytical performance, comparability evaluations can be made with previous data for which precision and accuracy data are available.

EDAP/TXTJOANN

The DQOs presented herein are to be used for future monitoring and characterization activities. As future characterization activities are identified, these DQOs will be reviewed. If the existing DQOs are acceptable and appropriate, they will be applied. If not, new DQOs will be developed. The DQOs presented in this summary will be reviewed annually and updated as appropriate.

DATA QUALITY OBJECTIVES FOR THE WSSRAP
PRECISION AND ACCURACY GUIDLINES
FOR ROUTINE MONITORING AND CHARACTERIZATION

CATEGORY	ANALYTICAL PARAMETER	ANALYTICAL LEVEL	ANALYTICAL METHOD b	MDC b UG/G	PRECISION (soil)	ACCURACY (soil)	MDL b UG/L	PRECISION (water)	ACCURACY (water)	COMMENTS
RADIATION SCREENING	GROSS ALPHA	I	2.6.4 *	NA	NA	NA	NA	NA	NA	ES&H SOP
	GROSS BETA/GAMMA	I	2.6.3 *	NA	NA	NA	NA	NA	NA	ES&H SOP
FIELD MEASUREMENTS	pH	I	4.5.1 *	NA	NA	NA	NA	20	NA	ES&H SOP
	TEMPERATURE	I	4.5.1 *	NA	NA	NA	NA	20	NA	ES&H SOP
	CONDUCTIVITY	I	4.5.2 *	NA	NA	NA	NA	20	NA	ES&H SOP
	SPECIFIC IONS	I	4.5.5 *	NA	NA	NA	NA	20	NA	ES&H SOP
	ORGANIC VAPORS	I	3.1.1 *	NA	NA	NA	NA	20	NA	ES&H SOP
	SETTLEABLE SOLIDS	I	4.5.7 *	NA	NA	NA	0.1	20	NA	ES&H SOP
	TH-230, TH-232	II	UNC	2 pCi/g	50	50	NA	NA	NA	
ONSITE RADIOLOGICAL MEASUREMENTS	U-238, U-235,	III	901.1	1 pCi/g	50	30	NA	NA	NA	
	RA-226, RA-228	III	901.1	1 pCi/g	50	20	NA	NA	NA	
	TH-230, TH-232	II	UNC	2 pCi/g	50	20	NA	NA	NA	
	GROSS ALPHA	III	2.4.3*	NA	NA	NA	NA	NA	NA	ES&H SOP
OFFSITE RADIOLOGICAL MEASUREMENTS	NAT. URANIUM	III	EPA 908.0	1 pCi/g	50	30	1 pCi/l	20	20	
	RADIUM-226, -228	III	EPA 903.1	1 pCi/g	50	30	1 pCi/l	20	20	
	THORIUM-230, -232	III	EERF 00/07	1 pCi/g	50	30	1 pCi/l	20	20	
	GROSS ALPHA	III	EPA 900.0	3 pCi/g	50	30	3 pCi/l	40	40	
	GROSS BETA	III	EPA 900.0	3 pCi/g	50	30	8 pCi/l	40	40	
NITROAROMATIC COMPOUNDS	TNT	III	USATHAMA	1.2	e	e	0.03 d	f	f	
	2,4-DNT	III	USATHAMA	0.75	e	e	0.03 d	f	f	
	2,6-DNT	III	USATHAMA	1.41	e	e	0.01 d	f	f	
	1,3,5-TNB	III	USATHAMA	0.57	e	e	0.03 d	f	f	
	1,3-DNB	III	USATHAMA	0.9	e	e	0.09 d	f	f	
	NITROBENZENE	III	USATHAMA	1.44	e	e	0.03 d	f	f	
MISC.	TSS	III	EPA 160.2	NA	NA	NA	2	20	20	
	TDS	III	EPA 160.2	NA	NA	NA		20	20	
	TOC	III	EPA 415.1				0.1	20	20	
	LITHIUM	III	EPA 200.7	5	50	50	50	20	20	
	MO	III	EPA 200.7	4	50	50	4	20	20	
	ZR	III	EPA 200.7	20	50	50	20	20	20	
	CR+3	III	EPA 200.7		50	50	10	20	20	
	CR+6	III	COLORIMETRIC		50	50	5	20	20	
	TOX	III	EPA 450.0	5	50	50		20	20	
	NO3	III	300.0/353.2c	0.5	50	50	0.25/0.1c*	20	20	MG/L
	SO4	III	300.0/375.4c	5	50	50	1.0/1.0c*	20	20	MG/L
	CL	III	300.0/325.1c	1.5	50	50	0.25/0.2c*	20	20	MG/L
	FL	III	300.0/340.2c	1.25	50	50	0.25/0.6c*	20	20	MG/L
	NO2	III	300.0	0.5	50	50		20	20	MG/L
	% MOISTURE	II	ASTM	NA	50	NA	NA	NA	NA	
	pH (SOIL)	III	EPA 160.2	NA	50	NA	NA	NA	NA	
	ASBESTOS-PCM/TEM	III	3.1.4	NA	NA	NA	NA	NA	NA	ES&H SOP
CLP-VOA		IV	CLP	CRDL	AS REQUIRED BY CLP		CRDL	AS REQUIRED BY CLP		

DATA QUALITY OBJECTIVES FOR THE WSSRAP
PRECISION AND ACCURACY GUIDLINES
FOR ROUTINE MONITORING AND CHARACTERIZATION

CATEGORY	ANALYTICAL PARAMETER	ANALYTICAL LEVEL	ANALYTICAL METHOD b	MDC b UG/G	PRECISION (soil)	ACCURACY (soil)	MDL b UG/L	PRECISION (water)	ACCURACY (water)	COMMENTS
CLP-SEMIVOA -	BNA	IV	CLP	CRDL	AS REQUIRED BY CLP		CRDL	AS REQUIRED BY CLP		
CLP-PEST/PCB		IV	CLP	CRDL	AS REQUIRED BY CLP		CRDL	AS REQUIRED BY CLP		
CLP-METALS	AL	IV	CLP-ICP	20	AS REQUIRED BY CLP		200	AS REQUIRED BY CLP		
	AS	IV	CLP-ICP	1	AS REQUIRED BY CLP		10	AS REQUIRED BY CLP		
	BE	IV	CLP-ICP	0.5	AS REQUIRED BY CLP		5	AS REQUIRED BY CLP		
	CD	IV	CLP-ICP	0.5	AS REQUIRED BY CLP		5	AS REQUIRED BY CLP		
	CR	IV	CLP-ICP	1	AS REQUIRED BY CLP		10	AS REQUIRED BY CLP		
	CU	IV	CLP-ICP	2.5	AS REQUIRED BY CLP		25	AS REQUIRED BY CLP		
	PB	IV	CLP-AA	0.5	AS REQUIRED BY CLP		5	AS REQUIRED BY CLP		
	HG	IV	CLP-CV	0.1	AS REQUIRED BY CLP		0.2	AS REQUIRED BY CLP		
	NI	IV	CLP-ICP	4	AS REQUIRED BY CLP		40	AS REQUIRED BY CLP		
	NA	IV	CLP-ICP	500	AS REQUIRED BY CLP		5000	AS REQUIRED BY CLP		
	ZN	IV	CLP-ICP	2	AS REQUIRED BY CLP		20	AS REQUIRED BY CLP		
	BA	IV	CLP-ICP	20	AS REQUIRED BY CLP		200	AS REQUIRED BY CLP		
	AG	IV	CLP-ICP	1	AS REQUIRED BY CLP		10	AS REQUIRED BY CLP		
	FE	IV	CLP-ICP	10	AS REQUIRED BY CLP		10	AS REQUIRED BY CLP		
	K	IV	CLP-ICP	500	AS REQUIRED BY CLP		5000	AS REQUIRED BY CLP		
	MN	IV	CLP-ICP	1.5	AS REQUIRED BY CLP		15	AS REQUIRED BY CLP		
	MG	IV	CLP-ICP	500	AS REQUIRED BY CLP		5000	AS REQUIRED BY CLP		
	SE	IV	CLP-AA	0.5	AS REQUIRED BY CLP		5	AS REQUIRED BY CLP		
	VA	IV	CLP-ICP	5	AS REQUIRED BY CLP		50	AS REQUIRED BY CLP		
	TL	IV	CLP-AA	1	AS REQUIRED BY CLP		10	AS REQUIRED BY CLP		
	SB	IV	CLP-ICP	6	AS REQUIRED BY CLP		60	AS REQUIRED BY CLP		
	CA	IV	CLP-ICP	500	AS REQUIRED BY CLP		5000	AS REQUIRED BY CLP		
	CO	IV	CLP-ICP	5	AS REQUIRED BY CLP		50	AS REQUIRED BY CLP		
OTHER PARAMETERS NOT LISTED		II,III,IV	TBD	TBD	50	50	TBD	20	20	SEE NOTE

* - SEE COMMENT SECTION
TBD - TO BE DETERMINED
NA - NOT APPLICABLE
ACCURACY = PERCENT BIAS = PERCENT RECOVERY - 100
a - ACCURACY AND PRECISION DATA PRESENTED FROM EPA DQO GUIDANCE DOCUMENT - SPECIFIC PRECISION AND ACCURACY TO BE NEGOTIATED WITH THE LABORATORY
b - DETECTION LIMITS AND METHODS FROM EXISTING CONTRACT WITH metaTRACE - NEW DETECTION LIMITS AND/OR METHODS TO BE ESTABLISHED WITH NEW LABORATORY
c - JTC METHODS AND DETECTION LIMITS
d - ARMY ENVIRONMENTAL HYGIENE AGENCY (AEHA) DETECTION LIMITS
e - TO BE NEGOTIATED WITH THE LABORATORY
f - TO BE PROVIDED BY AEHA
NOTE: GENERIC DQOS APPLY TO MEDIA AND/OR ANALYTICAL METHODS NOT LISTED IN THIS TABLE. SPECIFIC DQOS MAY BE DEVELOPED AS A PART OF FUTURE SAMPLING AND ANALYSIS PLANS

APPENDIX B

Data Validation Documentation

SEMI-VOLATILES BY GC/MS - CHECKLIST PAGE 1 OF [ ]

Data Set #:	Related Datasets:	Analysis Date:

SAMPLES IN ANALYSIS SET:

WSSRAP ID	Lab ID	Lab File No.	Date Sampled	Date Rec'd	Date Extracted	HT OK?	Qualifiers
a.							
b.							
c.							
d.							
e.							
f.							
g.							
h.							
i.							
j.							
k.							
l.							
m.							
n.							
o.							
p.							
q.							
r.							
s.							
t.							

ANALYSIS SEQUENCE: (sample/FRN/time)

Dates: to

1.	16.
2.	17.
3.	18.
4.	19.
5.	20.
6.	21.
7.	22.
8.	23.
9.	24.
10.	25.
11.	26.
12.	27.
13.	28.
14.	29.
15.	30.

Date _____ Reviewer (printed) _____ Signature _____

DFTPP TUNE		Dataset #:
Tune File #:	Seq. #:	Instr. ID:
DFTPP Inj. Date:	DFTPP Inj. Time:	

m/e	Ion Abundance Criteria	% Rel. Abundance
51	30.0 - 60.0% of mass 198	
68	Less than 2.0% of mass 69	( )1
69	Mass 69 relative abundance	
70	Less than 2.0% of mass 69	( )1
127	40.0 - 60.0% of mass 198	
197	Less than 1.0% of mass 198	
198	Base Peak, 100% relative abundance	
199	5.0 - 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	Greater than 1.00% of mass 198	
441	Present, but less than mass 443	
442	Greater than 40.0% of mass 198	
443	17.0 - 23.0% of mass 442	( )2

1 - value is % mass 69 2 - value is % mass 442

MATRIX SPIKE/ MSD		Sample ID:				Matrix:	
COMPOUND	SEQ. NO.	SPIKE ADDED	SAMP CONC	MS CONC	MS % REC	REC limits Water	REC limits Soil
Phenol						12-89	26-90
2-Chlorophenol						27-123	25-102
1,4-Dichlorobenzene						36-97	28-104
N-Nitroso-di-n-prop.						41-116	41-126
1,2,4-Trichlorobenzene						39-98	38-107
4-Chloro-3-methylphenol						23-97	26-103
Acenaphthene						46-118	31-137
4-Nitrophenol						10-80	11-114
2,4-Dinitrotoluene						24-96	28-89
Pentachlorophenol						9-103	17-109
Pyrene						26-127	35-142

COMPOUND	SEQ. NO.	SPIKE ADDED	MSD CONC	MSD % REC	% RPD	RPD limits Water	RPD limits Soil
Phenol						42	35
2-Chlorophenol						40	50
1,4-Dichlorobenzene						28	27
N-Nitroso-di-n-prop.						38	38
1,2,4-Trichlorobenzene						28	23
4-Chloro-3-methylphenol						42	33
Acenaphthene						31	19
4-Nitrophenol						50	50
2,4-Dinitrotoluene						38	47
Pentachlorophenol						50	47
Pyrene						31	36

RPD: _____out of _____ outside limits.

Spike recovery: _____out of _____outside limits.

COMMENTS:

INITIAL CALIBRATION					Date(s) performed:				
Instrument ID:					Calib.#:				
Data Set #:	Calc. Chk	MEAN RRF	% RSD	RT Chk		Calc. Chk	MEAN RRF	% RSD	RT Chk
2-Fluorophenol					3-Nitroaniline				
Phenol-d6					Acenaphthene		#	*	
Phenol			*		2,4-Dinitrophenol		#		
bis(2-Chloroethyl)ether					4-Nitrophenol		#		
2-Chlorophenol					Dibenzofuran				
1,3-Dichlorobenzene					2,4-Dinitrotoluene				
1,4-Dichlorobenzene			*		2,6-Dinitrotoluene				
Benzyl Alcohol					Diethylphthalate				
1,2-Dichlorobenzene					4-Chlorophenyl-phenylether				
2-Methylphenol					Fluorene				
bis(2-Chloroisopropyl)ether					4-Nitroaniline				
4-Methylphenol					*2,4,6-Tribromophenol*				
N-Nitroso-di-n-propylamine		#			4,6-Dinitro-2-methylphenol				
Hexachloroethane					N-Nitrosodiphenylamine			*	
Nitrobenzene-d5					4-Bromophenyl-phenylether				
Nitrobenzene					Hexachlorobenzene				
Isophorone					Pentachlorophenol			*	
2-Nitrophenol			*		Phenanthrene				
2,4-Dimethylphenol					Anthracene				
Benzoic Acid					Di-n-butylphthalate				
bis(2-Chloroethoxy)methane					Fluoranthene			*	
2,4-Dichlorophenol			*		Pyrene				
1,2,4-Trichlorobenzene					*Terphenyl-d14*				
Naphthalene					Butylbenzylphthalate				
4-Chloroaniline					3,3'-Dichlorobenzidine				
Hexachlorobutidiene			*		Benzo(a)anthracene				
4-Chloro-3-methylphenol			*		bis(2-Ethylhexyl)phthalate				
2-Methylnaphthalene					Chrysene				
Hexachlorocyclopentadiene		#			Di-n-octylphthalate			*	
2,4,6-Trichlorophenol			*		Benzo(b)fluoranthene				
2,4,5-Trichlorophenol					Benzo(k)fluoranthene				
2-Fluorobiphenyl					Benzo(a)pyrene			*	
2-Chloronaphthalene					Indeno(1,2,3-cd)pyrene				
2-Nitroaniline					Dibenzo(a,h)anthracene				
Dimethylphthalate					Benzo(g,h,i)perylene				
Acenaphthylene									

Min. RRF for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

CONTINUING CALIBRATION					Date performed:				
Date of initial Calib.:					Init Calib #:				
Instrument ID:									
Data Set #:	Calc. Chk'	RT Chk'	RRF50	% Diff		Calc. Chk'	RT Chk'	RRF50	% Diff
2-Fluorophenol					3-Nitroaniline				
Phenol-d6					Acenaphthene			#	*
Phenol				*	2,4-Dinitrophenol			#	
bis(2-Chloroethyl)ether					4-Nitrophenol			#	
2-Chlorophenol					Dibenzofuran				
1,3-Dichlorobenzene					2,4-Dinitrotoluene				
1,4-Dichlorobenzene				*	2,6-Dinitrotoluene				
Benzyl Alcohol					Diethylphthalate				
1,2-Dichlorobenzene					4-Chlorophenyl-phenylether				
2-Methylphenol					Fluorene				
bis(2-Chloroisopropyl)ether					4-Nitroaniline				
4-Methylphenol					*2,4,6-Tribromophenol*				
N-Nitroso-di-n-propylamine			#		4,6-Dinitro-2-methylphenol				
Hexachloroethane					N-Nitrosodiphenylamine				*
Nitrobenzene-d5					4-Bromophenyl-phenylether				
Nitrobenzene					Hexachlorobenzene				
Isophorone					Pentachlorophenol				*
2-Nitrophenol				*	Phenanthrene				
2,4-Dimethylphenol					Anthracene				
Benzoic Acid					Di-n-butylphthalate				
bis(2-Chloroethoxy)methane					Fluoranthene				*
2,4-Dichlorophenol				*	Pyrene				
1,2,4-Trichlorobenzene					*Terphenyl-d14*				
Naphthalene					Butylbenzylphthalate				
4-Chloroaniline					3,3'-Dichlorobenzidine				
Hexachlorobutidiene				*	Benzo(a)anthracene				
4-Chloro-3-methylphenol				*	bis(2-Ethylhexyl)phthalate				
2-Methylnaphthalene					Chrysene				
Hexachlorocyclopentadiene			#		Di-n-octylphthalate				*
2,4,6-Trichlorophenol				*	Benzo(b)fluoranthene				
2,4,5-Trichlorophenol					Benzo(k)fluoranthene				
2-Fluorobiphenyl					Benzo(a)pyrene				*
2-Chloronaphthalene					Indeno(1,2,3-cd)pyrene				
2-Nitroaniline					Dibenzo(a,h)anthracene				
Dimethylphthalate					Benzo(g,h,i)perylene				
Acenaphthylene									

Min. RRF50 for SPCC(#) = 0.050 Max %Diff for CCC(*) = 25.0%

SURROGATE RECOVERIES

Dataset #: Sample matrix:

SEQ. #	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	Tot Out
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
27.							
28.							
29.							
30.							

	CLP QC Limits Water	Soil
S1 (NBZ) = Nitrobenzene-d5	(35-114)	(23-120)
S2 (FBP) = 2-Fluorobiphenyl	(43-116)	(30-115)
S3 (TPH) = Terphenyl-d14	(33-141)	(18-137)
S4 (PHL) = Phenol-d6	(10-94)	(24-113)
S5 (2FP) = 2-Fluorophenol	(21-100)	(25-121)
S6 (TBP) = 2,4,6-Tribromophenol	(10-123)	(19-122)

COMMENTS:

INTERNAL STANDARD AREA SUMMARY

Data Set #	IS1 (DCB)	RT	IS2 (NPT)	RT	IS3 (ANT)	RT	IS4 (PHN)	RT	IS5 (CRY)	RT	IS6 (PRY)	RT
12 Hour Std.												
Upper lmt.												
Lower lmt.												
SEQ #												
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10.												
11.												
12.												
13.												
14.												
15.												
16.												
17.												
18.												
19.												
20.												
21.												
22.												
23.												
24.												
25.												
26.												
27.												
28.												
29.												
30.												

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10
Upper lmt. = +100% of IS area

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12
Lower lmt. = - 50% of IS area

METHOD BLANK SUMMARY		Seq. #:
Data Set #:	Analysis Date:	FRN:
	Extraction Date:	Lab Lot #:

Compound	Conc. (ugl or ugkg)	Compound	Conc. (ugl or ugkg)
2-Fluorophenol		3-Nitroaniline	
Phenol-d6		Acenaphthene	
Phenol		2,4-Dinitrophenol	
bis(2-Chloroethyl)ether		4-Nitrophenol	
2-Chlorophenol		Dibenzofuran	
1,3-Dichlorobenzene		2,4-Dinitrotoluene	
1,4-Dichlorobenzene		2,6-Dinitrotoluene	
Benzyl Alcohol		Diethylphthalate	
1,2-Dichlorobenzene		4-Chlorophenyl-phenylether	
2-Methylphenol		Fluorene	
bis(2-Chloroisopropyl)ether		4-Nitroaniline	
4-Methylphenol		*2,4,6-Tribromophenol*	
N-Nitroso-di-n-propylamine		4,6_Dinitro-2-methylphenol	
Hexachloroethane		N-Nitrosodiphenylamine	
Nitrobenzene-d5		4-Bromophenyl-phenylether	
Nitrobenzene		Hexachlorobenzene	
Isophorone		Pentachlorophenol	
2-Nitrophenol		Phenanthrene	
2,4-Dimethylphenol		Anthracene	
Benzoic Acid		Di-n-butylphthalate	
bis(2-Chloroethoxy)methane		Fluoranthene	
2,4-Dichlorophenol		Pyrene	
1,2,4-Trichlorobenzene		*Terphenyl-d14*	
Naphthalene		Butylbenzylphthalate	
4-Chloroaniline		3,3'-Dichlorobenzidine	
Hexachlorobutidiene		Benzo(a)anthracene	
4-Chloro-3-methylphenol		bis(2-Ethylhexyl)phthalate	
2-Methylnaphthalene		Chrysene	
Hexachlorocyclopentadiene		Di-n-octylphthalate	
2,4,6-Trichlorophenol		Benzo(b)fluoranthene	
2,4,5-Trichlorophenol		Benzo(k)fluoranthene	
2-Fluorobiphenyl		Benzo(a)pyrene	
2-Chloronaphthalene		Indeno(1,2,3-cd)pyrene	
2-Nitroaniline		Dibenzo(a,h)anthracene	
Dimethylphthalate		Benzo(g,h,i)perylene	
Acenaphthylene		# of TIC's (list below)	

TIC	RT	Conc.	TIC	RT	Conc.
1.			11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

SEMI-VOLATILES BY GCMS - CHECKLIST PAGE [ ] OF [ ]

WSSRAP ID:	Dataset #:	Seq. No.:
Lab No.:	Lab File No.:	
Level: L/M	GPC'd?: Y/N	% Moisture:
Dilution Factor:		Sample Volume (g or ml):

	Primary Ion	Secondary Ion(s)	Ion Chk	Calc Chk	Ret. Time	Conc. ugl or ugkg	Conc. in DB
2-Fluorophenol	112	64					
Phenol-d6	99	42,71					
Phenol	94	65,66					
bis(2-Chloroethyl)ether	93	63,95					
2-Chlorophenol	128	64,130					
1,3-Dichlorobenzene	146	148,113					
1,4-Dichlorobenzene	146	148.113					
Benzyl Alcohol	108	79,77					
1,2-Dichlorobenzene	146	148,113					
2-Methylphenol	108	107					
bis(2-Chloroisopropyl)ether	45	77,79					
4-Methylphenol	108	107					
N-Nitroso-di-n-propylamine	70	42,101,130					
Hexachloroethane	117	201,199					
Nitrobenzene-d5	82	128,54					
Nitrobenzene	77	123,65					
Isophorone	82	95,138					
2-Nitrophenol	139	65,109					
2,4-Dimethylphenol	107	121,122					
Benzoic Acid	122	105,77					
bis(2-Chloroethoxy)methane	93	95,123					
2,4-Dichlorophenol	162	164,98					
1,2,4-Trichlorobenzene	180	182,145					
Naphthalene	128	129,127					
4-Chloroaniline	127	129					
Hexachlorobutidiene	225	223,227					
4-Chloro-3-methylphenol	107	144,142					
2-Methylnaphthalene	142	141					
Hexachlorocyclopentadiene	237	235,272					
2,4,6-Trichlorophenol	196	198,200					
2,4,5-Trichlorophenol	196	198,200					
2-Fluorobiphenyl	172	171					
2-Chloronaphthalene	162	164,127					
2-Nitroaniline	65	92,138					
Dimethylphthalate	163	194,164					
Acenaphthylene	152	151,153					

SEMI-VOLATILES BY GCMS - CHECKLIST PAGE [ ] OF [ ]

WSSRAP ID:	Dataset #:	Seq. No.:
Lab No.:	Lab File No.:	
Level: L/M	GPC'd?: Y/N	% Moisture:
Dilution Factor:		Sample Volume (g or ml):

	Primary Ion	Secondary Ion(s)	Ion Chk	Calc Chk	Ret. Time	Conc. ugl or ugkg	Conc. in DB
3-Nitroaniline	138	108,92					
Acenaphthene	153	152,154					
2,4-Dinitrophenol	184	63,154					
4-Nitrophenol	109	139,65					
Dibenzofuran	168	139					
2,4-Dinitrotoluene	165	63,182					
2,6-Dinitrotoluene	165	89,121					
Diethylphthalate	149	177,150					
4-Chlorophenyl-phenylether	204	206,141					
Fluorene	166	165,167					
4-Nitroaniline	138	92,108					
2,4,6-Tribromophenol	330	332,141					
4,6-Dinitro-2-methylphenol	198	182,77					
N-Nitrosodiphenylamine	169	168,167					
4-Bromophenyl-phenylether	248	250,141					
Hexachlorobenzene	284	142,249					
Pentachlorophenol	266	264,268					
Phenanthrene	178	179,176					
Anthracene	178	179,176					
Di-n-butylphthalate	149	150,104					
Fluoranthene	202	101,100					
Pyrene	202	101,100					
Terphenyl-d14	244	122,212					
Butylbenzylphthalate	149	91,206					
3,3'-Dichlorobenzidine	252	254,126					
Benzo(a)anthracene	228	229,226					
bis(2-Ethylhexyl)phthalate	149	167,279					
Chrysene	228	226,229					
Di-n-octylphthalate	149	-					
Benzo(b)fluoranthene	252	253,125					
Benzo(k)fluoranthene	252	253,125					
Benzo(a)pyrene	252	253,125					
Indeno(1,2,3-cd)pyrene	276	138,227					
Dibenzo(a,h)anthracene	278	139,279					
Benzo(g,h,i)perylene	276	138,277					

SEMI-VOLATILES BY GCMS - CHECKLIST PAGE [ ] OF [ ]

WSSRAP ID:	Dataset #:	Seq. No.:
Lab No.:	Lab File No.:	
Level: L/M	GPC'd?: Y/N	% Moisture:
Dilution Factor:		Sample Volume (g or ml):

# of TICs: Compound name	Ret. Time	Quant. ion	Conc. ugl or ugkg	Conc. in DB
1.				
2.				
3.				
4.				
5.				
6.				
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30.				

ATTACHMENT B

MISSOURI DEPARTMENT OF CONSERVATION

1/2

MAILING ADDRESS
P.O. Box 180
Jefferson City, Missouri 65102-0180

STREET LOCATION
2901 West Truman Boulevard
Jefferson City, Missouri

Telephone: 314/751-4115
JERRY J. PRESLEY, Director

January 22, 1990

ADMINISTRATIVE RECORD (_____ ARFS)
FILE NUMBER: _____ SECTION: _____
DOCUMENT NUMBER: _____ DATE: _____
DOCUMENT TITLE:

AUTHOR: _____ RECIPIENT: _____
TYPE: _____ # OF PAGE: _____

Dr. David Bedan
Department of Natural Resources
Division of Environmental Quality
P. O. Box 176
Jefferson City, Missouri 65102

Dear Dr. Bedan:

In response to your November 22, 1989 memo, we have reviewed the Draft Remedial Investigation Report for the Weldon Spring Site Remedial Action Project prepared by the U. S. Department of Energy. As usual the document is well done. One question that prevailed as I reviewed the document was whether this was a document that decided action or one that simply laid out the situation. I found some indications of both.

Several questions related to our Busch and Weldon Spring Wildlife Areas came to light. They are:

1. Page 5-112 through 5-122. It appears that the Department of Conservation sites 1, 3, 4, 5, 7 and 9 require remediation while sites 2, 6, 8 and 10 apparently do not require remediation. Sites 1, 2 and 10 apparently have been cleared up. Site 6 is recommended to be remediated during quarry cleanup. Why not include site 8 in the remediation of quarry cleanup?

2. Page 5-123. We concur in the need for cleanup of Southeast Drainage.

3. Page 5-132. Sediment samples from Site SD-4001, Lake 36, SD-4007 and Lake 35 have mean uranium levels of 31 pCi/g, 30 pCi/g, 26 pCi/g and 23.6 pCi/g. The reference level for uranium indicated on page 5 of the Executive Summary is 15 pCi/g. Would it follow that remediation on these sites is warranted since they exceed the reference level?

4. Page 5-155 and 5-157. Data are puzzling to us. We have collected a set of fish flesh samples for lead analyses. We would hope that as more data become available a decision can

be made on appropriate action to respond to elevated lead levels. With very high lead levels in Ash Pond and upstream of Lake 36, how will the Department of Energy interact with the Department of Army on cleanup activities?

We appreciate your patience in soliciting our comments. If you have questions or wish to discuss these comments, please call me.

Sincerely,

W. H. Dieffenbach

WILLIAM H. DIEFFENBACH
ASST. ENVIRONMENTAL ADMINISTRATOR

WHD:jct

(action) Ker
Steve
File

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

JAN 2 3 1990

Mr. Steve McCracken
Acting Project Manager
U.S. Department of Energy
Weldon Spring Site Remedial
Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

Dear Mr. McCracken:

We have completed our review of the draft Remedial Investigation Report for the Chemical Plant and Raffinate Pit Area dated September 1989. Overall, the report presents a good summarization and evaluation of the various data collection efforts. Our comments and suggested revisions are enclosed with this letter.

Please call if you have any questions.

Sincerely yours,

Robert L. Morby
Chief, Superfund Branch
Waste Management Division

Enclosure

cc: David Bedan, MDNR (w/encl.)

1/29/90

REVIEW COMMENTS ON THE DRAFT REMEDIAL
INVESTIGATION REPORT FOR THE WELDON SPRING SITE

January 1990

General Comments:

1. The scope of the remedial investigation needs to be more fully defined. It may not be clear to the reader that the report is only intended to examine the contamination from the uranium processing plant, and the contamination from explosives production which is inside the DOE property lines. The rationale for this definition needs to be presented, since property lines are generally not relevent to the definition of the extent of contamination. It remains EPA's position that the DOE's and the U.S. Army's respective responsibilities must be defined in a written agreement to ensure that all needed investigation will be completed in an efficient manner. The adequacy of the scope of the RI needs to be evaluated in the context of such an agreement.

2. The field sampling plans which were developed and implemented to form the basis of the RI report are described in the report; however, the reader is not clearly directed to the respective sampling investigation reports which presumably contain more focused and thorough analysis than the summaries contained in the RI report.

3. A useful summary of data gap analyses and general plans for additional data collection is not presented.

4. The data available for analysis of ecological impacts appears to be limited. The impacts of contamination on the wildlife is presented only in the context of the implications to human health. A complete baseline risk assessment must consider environmental effects as well as public health effects. Information on the numbers of species using the contaminated area, their reproductive success, and any evidence that the contamination is affecting the viability of local wildlife populations should be presented.

Detailed Comments:

1. The Table of Contents should be expanded to include a list of plates.

2. In the Executive Summary (page 1), there is a statement which refers to the percentage of land transferred to the U.S. Atomic Energy Commission (AEC) versus the amount of land originally used

for ordnance production. Ten percent is the amount quoted; whereas, the actual amount is closer to one percent as explained in Appendix H. The original site covered 17,232 acres compared to 205 acres transferred from the Department of Army (DA) to AEC.

3. In the third paragraph of the Executive Summary, there are statements which are contradictory. It is stated first that the Weldon Spring Raffinate Pit (WSRP) and the Weldon Spring Chemical Plant (WSCP) areas are on the National Priorities List. The next sentence states that they have been nominated to be on the list.

4. On page 8 in the third paragraph, the reference to Figure 7 should be to Figure 6.

5. The first sentence of the first paragraph on page 10 should be rewritten. It appears that nitroaromatics precipitate in the unsaturated zone before reaching the saturated zone.

6. Several conflicting statements were found. As an example, on page 10 in the Executive Summary, the following statement is made: "Nitroaromatic compounds quickly degrade upon exposure to sunlight and therefore are not transported in surface waters." It is noted on page 6-16, Vol. I that the nitroaromatics TNB and DNB are not subject to photolytic degradation. Also, on page 1-4, the Army Reserve is 1,843 acres, while on page 3-13, Vol. I, it is approximately 1,660 acres.

7. On page 1-5 in the second paragraph, the text states that the Weldon Spring Wildlife Area is located across Missouri Highway 94. Figure 1.2-2, which is referenced, shows the site and the wildlife area on the same side of the highway.

8. Numerous abbreviations labeling buildings, water towers, etc., are shown on Plate 1. A legend should be provided to identify the structures.

9. Table 3.7-1 should indicate what the numbers on the table represent such as the number of samples taken.

10. In Section 4.5.11, page 4-33, second paragraph, it is concluded that the observed net infiltration in the raffinate ponds is "closely related" to the measured hydraulic conductivities of the underlying material. In fact, those hydraulic conductivities span four orders of magnitude. The magnitude of the measured net infiltration lies in the middle of that range. While this is to be expected, it may be misleading to use the term "closely related" to characterize this agreement.

11. The discussion on stratigraphy is good; however, we suggest that the surface soils be addressed in terms of the Department of Agriculture's soil series and descriptions.

12. Page 4-1 references Figure 4.1-2 for site elevations, but it only shows elevations for the surrounding area.

13. The term "normal" is also used incorrectly. In meteorology, "normal" refers to averages of climatological data for the 30-year period from 1951 through 1980. In the context used in the report, either the term "average" or "mean" is more appropriate.

14. The legend on Figure 4.3-2 should include a description of the well, trench and borehole numbering system.

15. In the first paragraph on page 4-21, the last sentence indicates that the four raffinate pits do not contribute to direct runoff; however, Figure 4.4-2 seems to show flow out of pit number 4. Table 4.4-2 also indicates the raffinate pits are closed basins, but Figure 4.4-3 seems to show a stream gage that measures the outflow from pit 4.

16. The term "swallow holes" appears occasionally. Pages 4-26, 4-30 and 4-31 refer to "swallow holes" and Figures 4.4-4 and 4.4-11 refer to "shallow holes." Definitions should be provided since it is not clear what these holes are.

17. The method used for estimating surface runoff on page 4-24 is not a very reliable one. A better approach would have been to calibrate a model to the measured events, then use a historical sequence of precipitation events to determine average runoff conditions. An alternative approach would be to examine records from similar gaged watersheds in the area.

18. On page 4-31, the definition of the vadose zone is misleading. The vadose zone may be temporarily saturated due to surface ponding and may have perched water tables. Perched water tables are mentioned on page 6-4. A possible definition is the zone between the soil surface and the permanently saturated zone.

19. On page 4-33, there is a discussion about lysimeters and that they were installed to determine possible contaminant migration. More explanation is needed to explain how a lysimeter would show contaminant migration. The discussion on page 5-141 about lysimeters is even more confusing on just how the lysimeters are being used. On Table 5.4-1, lysimeter LYS3506 should be LYS3606.

How does the comparison of the two figures lead to the conclusion of a deep "trough"? The discussion which continues onto page 6-B appears to contradict this conclusion. This paragraph is confusing and needs clarification.

29. The discussion on the factors affecting the persistence and attenuation of organic compounds should be expanded. Sometimes degradation products are more toxic than the parents. Were the degradation products adequately sampled and analyzed?

30. On page 6-16 in the first sentence of Section 6.2.7.2, change "deleted" to "detected".

31. From January 1967 to February 1969, the Department of the Army prepared plans to design and construct a plant at the site to produce the herbicide "agent orange". This fact is mentioned in the appendix, but the appendix does not indicate that there was no actual production of the herbicide at the Weldon Spring site during that two-year period.

32. Important information appears missing from the appendices. Descriptions of the monitoring well construction and sampling techniques should have been included.

20. The second paragraph on page 4-35 refers to Figure 4.5-5 when it should really be 4.5-6.

21. On page 4-40 in the third paragraph, briefly explain why the Bouwer and Rice method is believed to be the more reliable method.

22. The loss by seepage from the raffinate pits should be reported as a volume per unit of time. The second paragraph on page 4-47 only specifies an apparent velocity.

23. In Chapter 5, many concentrations are discussed in various samples. Generally, these concentrations are not referenced with any standard to indicate if the concentration is significant in terms of human health or the environment. Page 5-16 has numerous examples of this. Page 5-22, last paragraph, provides the kind of comparison to an established standard that would be helpful throughout the document.

24. An inconsistency was noted in Section 5.1.2.3, page 5-14, second paragraph. The report indicates that the evaporation of all water from raffinate pits 1 and 2 has not happened since 1980; however, Table 5.1-16 indicates a dry surface in 1987. A clarification is needed.

25. Tables 5.1-6 and 5.1-7 have the same title. One of them should be changed to reflect the differences in the data presented.

26. Section 3 of the report describes the investigations conducted at the site. To keep the report consistent, we suggest that the radiological investigations be described in that section as well, rather than in Section 5.

27. On Tables 5.2-2 through 5.2-31, there does not appear to be any difference between the constituents labeled "Other contaminants at levels above two times their upper background limit" and those labeled "...above their upper background limit."

28. The last paragraph on page 6-7 uses a comparison of Figures 4.6-3 and 4.6-4 to indicate a deep ground water "trough" extending from the Weldon Spring site to the Burgermeister Spring. It is suggested that conduit flow velocities in this "trough" are on the order of two feet per minute. This velocity is several orders of magnitude greater than any other reported velocities in the area. Because of this and the potential for very rapid offsite migration of contaminants, there should be more discussion about this "trough." How were these velocities calculated?

JOHN ASHCROFT
Governor

G. TRACY MEHAN III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MEMORANDUM

Division of Energy
Division of Environmental Quality
Division of Geology and Land Surve
Division of Management Services
Division of Parks, Recreation,
and Historic Preservation

DATE: January 29, 1990

TO: David Bedan, DEQ Administration

FROM: Peter Price, Geologist, DGLS

SUBJECT: Comments on Draft Remedial Investigation Report for the Weldon Spring Site Remedial Action Project, Rev. B

General Comments

Please reference MDNR's First Annual Report on the Shallow Groundwater Investigations at Weldon Spring, Missouri as MDNR, 1989 rather than Hoffman, 1989. Citations occur on pages 4-24, 26, 46, 50 and 51, on Table 4.6-9, and perhaps elsewhere.

Figure 4.1-2 presents a topographic map of the Weldon Spring area but is not detailed with respect to the site. Nowhere else is there a topographic map of the site. We would suggest adding a topographic map of the site at the same general scale as many of the other site maps in the report. Drainage patterns and surface features would be much more obvious with such a map in combination with the text descriptions.

Specific Comments

Table 4.6-1 - footnote (d) is not explained

P. 3-22 MDNR Dye Tracing Studies - this section does not report MDNR-DGLS dye tracing experiments correctly. Only two borehole dye traces were attempted in 1983 (MW 2020, March 9; MW 3007, April 7) by Dean. The report only mentions one losing stream dye trace (from West Raffinate Pit Drainage, Feb. 1984) of three conducted. The other two were from the head of the Southeast Drainage (June 1984) and from Ash Pond Drainage (March 1985). The 1988 attempted borehole traces are adequately described. Fig. 3.4-4, Water Tracing Sample Locations, appears to be a modified version of a map produced by MDNR-DGLS (MDNR, 1989).

P. 3-29, Section 3.7.1.6 - This section mentions recent (1988-1989) exploration programs, to help describe site geology, conducted by the PMC. Some information from these programs is presented in tabular form (Table 4.3-1) but drilling logs are not presented in the RI Report. Are drilling logs from these recent programs presented in another document?

P. 4-9, Section 4.3.1.1 - The Bushberg Sandstone has been reported in the literature as a Devonian age formation (Kleeschulte and Emmett, 1987; Miller, et al, 1974; Koenig, 1961). However, more recently the Bushberg has been assigned to the Mississippian System (Thompson, 1986). The text and Figure 4.3-1 should reflect current understanding.

The term "unit" is not customarily capitalized since it is not part of the formal name of a formation. Unit is capitalized several places on this page.

The thickness figures given for the Warsaw and Salem formations do not agree with those given in Figure 4.3-1. The thickness figures in the text refer to the site area for most formations. The descriptions of the Warsaw and Salem do not, and may mislead the reader.

P. 4-10, paragraph 2 - Alluvium overlies units other than glacial drift and loess in the vicinity of the site. The last sentence of this paragraph is incorrect.

P. 4-10, Section 4.3.1.2 - This section presents several isopach and contour maps of the site presumably generated from the geologic database. A check of several data points against geologic logs, particularly on Figure 4.3-19, reveals several points in disagreement with plotted contours or isopachs. Many data points cannot be checked because geologic logs have not been presented in this document or elsewhere. Is there an explanation for these apparent conflicts?

P. 4-13 - The residuum unit is described as an individual stratigraphic unit in the text but is not represented as such in the Generalized Stratigraphic Column (Figure 4.3-1). There is a problem in assigning it an age but it should be represented, perhaps as "Quaternary or pre-Quaternary" may be most appropriate.

P. 4-14 - MDNR-DGLS does not consider a hydraulic conductivity of 5×10^{-8} cm/sec. to be representative of the residuum unit. Our experience indicates that it has a much higher permeability. We support further sampling and testing of this unit, as mentioned.

P. 4-28 - The descriptions of gaining and losing reaches, particularly in paragraphs 2 and 3, are not clear because mentioned landmarks are incorrectly named and not represented on the reference maps. Road DD is maintained by the State and might better be referred to as State Road DD. Road C and B are Busch Wildlife Area roads and are not shown on Figure 4.4-9.

P. 4-30 - The March 1985 injection of dye was detected only at Burgermeister and its wet weather springs (SP 6301 and SP 6302). Dye was not recovered at SP 6303 (Dean, 1985; MDNR, 1989).

P. 4-35 - Second paragraph refers to Figure 4.5-5 but should probably be 4.5-4.

P. 4-44 - Section 4.6.2.5 Are final pump test results available? If available, the results should be presented and their significance explained.

(action) Ken w/o att. Ester

JOHN ASHCROFT
Governor

G. TRACY MEHAN III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation, and Historic Preservation

DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176
Jefferson City, MO 65102

February 21, 1990

Mr. Steve McCracken
U.S. Department of Energy
Weldon Spring Remedial
Action Project
Route 2, Highway 94 South
St. Charles, Missouri 63303

Dear Mr. McCracken:

The Missouri Department of Natural Resources (DNR) has reviewed the draft Remedial Investigation Report for the Weldon Spring Site Remedial Action Project (DOE/OR/21548, September 1989). In general, the report presents a good summary of the characterization data on the Weldon Spring site.

Attached are comments from DNR's Waste Management Program, DNR's Division of Geology and Land Survey, and the Missouri Department of Conservation. No comments were received from the Missouri Department of Health.

Some additional specific comments are:

VOLUME I: Page 3-23, Section 3.4.5, Domestic Well Sampling: This section references the private well information received from the St. Charles Countians Against Hazardous Waste and the U.S. Geological Survey. Figure 3.4-5 is a preliminary map of the private well locations. The report does not discuss the extensive sampling data on these and other wells obtained by the Missouri Department of Health (MDOH) from 1982 to 1989. Attached is the MDOH data on these wells.

I suggest that you summarize this data and discuss its significance in demonstrating the limits of the groundwater contamination. This information may also be relevant to the baseline risk assessment in that it shows that private wells are not being affected by the uranium processing that occurred at the site. To protect the privacy of individuals, well owner names should not be used in the RI report.

3.5065
2/23/90

JOHN ASHCROFT
Governor

G. TRACY MEHAN III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MEMORANDUM

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation, and Historic Preservation

DATE: January 30, 1990

TO: Mr. Dave Bedan, Radioactive Waste Site Coordinator, DEQ Admin.

THROUGH: Mr. John Doyle, P.E., Chief, HWS, WMP JD

FROM: Mr. Dave Freise, P.E., EE, HWPU, HWS, WMP

SUBJECT: Comments on Draft RI (September 1989) for WSCP site

This RI primarily addresses the Weldon Spring Chemical Plant, however, the report, to a minor degree, discusses the Quarry Site. Presumably this is because it is planned for the Quarry Site wastes to be stored at the Chemical Plant Site. Appendix B of the report contains ARAR's which deal with both the Chemical Plant and Quarry wastes. The Appendix deals to a large degree with the Quarry wastes since there are potentially many more ARAR's for the Quarry wastes.

Since this is a first attempt, please don't spare the red pen if I'm to learn what's needed of me. If you have any questions, please contact me at 751-5942.

JDD:dfr

REVIEW COMMENTS ON DRAFT RI/FS AND ARARS FOR WSCP SITE

GENERAL COMMENTS

1. Although much of the TNT operations formerly located at the Chemical Plant were possibly taken care of at the "burn" sites, I would like to see some discussion of the leveling of the site to construct the Chemical Plant. From Plate #1 it appears TNT plants/lines 1 through 4 were located in areas extensively changed by construction of the chemical plant. It would seem logical that some TNT and DNT contaminated wastes were buried or disposed of on site or elsewhere during the construction of the chemical plant.

2. Some of the Interim Response Actions listed in Table 1.2-2 would appear to require a relatively long time to accomplish. ARAR's for these actions are not discussed. EPA policy has stated ARAR's would be followed at "removal actions" to the extent practicable.

3. The fish sampling for the biological contamination portion of the report did not include any bottom feeders. Since the contaminants could be in the sediments, bottom feeders would more likely be contaminated.

4. Were the soil samples analyzed by depth interval (relates to comment 1 above)? It was difficult to tell from the report.

5. Shouldn't Figure 7 of the report show the Twin Lakes development as a receptor?

6. Were the soils selected for background soil sampling of the same toxinomic units as those found at the WSCP site? In some instances the existing chemical plant surface soil may be a subsurface horizon due to the site grading which occurred.

7. Please keep in mind that those IRA's which call for off site disposal will probably require special solid waste permits.

8. Has there been any effort to explain the differences in concentrations between Table 5.1-11 (BNI samples) and Table 5.1-19 (PMC samples)? The BNI results are considerably higher on average.

9. Appendix F and other portions of the report make reference to evaporating the red and yellow waters. This appears unlikely given the flow rates of 40 to 50 mgd.

10. Appendix H makes at least 3 references to the disposal of red water sludges or TNT contaminated material. What efforts have been made to trace the ultimate fate of these materials? Can it definitely be stated they are not buried below the WSCP site or at the Quarry?

11. Has any effort been made to characterize the materials which were dumped into Pit Number 4 in December 1966?

RCRA ARAR - Comments (See Vol. III Appendix B)

1. General - The ARAR's tables did not address the chemically contaminated portions of the buildings, process equipment, or storage tanks. In certain instances portions of the WSCP buildings and equipment may be considered hazardous waste.

2. Table 3 - Has the EPA text; Permit Writers Guidance Manual for the Location of Hazardous Land Storage and Disposal Facilities: Phase I. Criteria for Location Acceptability and Existing Regulations for Evaluating Locations (Feb. 1985), been evaluated for "To be considered" ARAR's?

3. Table 4 - Airborne particulates from handling of RCRA waste must be controlled (264.251,.273,.301).

4. Table 5A, Removal Criteria, does not address RCRA materials which are radiologically contaminated. The treatment, storage, and disposal, of these materials will need to meet RCRA requirements.

5. Table 5B - Tank storage for some period of time in existing tanks appears to be a possibility. If so then 40 CFR 264.191 would be relevant and appropriate.

6. Table 5B, page 3 - Some sections of 40 CFR 264.193 and 194 may not be substantive [eg. (g), (h), (i)].

7. Table 5B, page 4 - Inspections of storage tanks should be relevant and appropriate (40 CFR 264.195).

8. Table 5B, page 8 - Inspection of containers would appear to be relevant and appropriate (40 CFR 264.174).

9. Table 5B, Page 11 and 12 - Although 40 CFR 264.341,.342, and .344 are directly related to permit requirements they would appear to be substantive since the incinerator efficiency or operating limits cannot be determined by the operator with out the required analysis.

10. Table 5B, page 12 - The monitoring requirements of 40 CFR 264.347 appear to be substantive to operate an incinerator.

11. Table 5B - Closure requirements of 40 CFR 264.351 appear to be substantive.

12. Table 5B, page 15 - It would appear that more of 40 CFR 265 subpart P would be relevant and appropriate since it is parallel to 40 CFR 264 subpart O.

13. Table 5C - Wouldn't 40 CFR 265.400 be a "to be considered"?

14. Table 5G - This table should include the Land Ban (40 CFR 268) since any land filled RCRA materials will have to be in compliance with the treatability standards.

15. Table 5G - Page 5, Section 315 of 40 CFR 264 would appear to be substantive.

16. The proposed rules of 40 CFR 269 would appear to be "to be considereds". Part of these rules were proposed on February 5, 1987 (52 FR 3748).

17. Subpart F of 40 CFR Part 264 would appear to be relevant and appropriate to the Quarry site itself.

STATE RCRA ARARS

1. Table 3 - MO. Hazardous Waste Regulations chapter 13 (PCB's) incorporate the chapter 7 (TSDF's) requirements. Locations of commercial facilities handling wastes which come under the PCB rules must comply with MO-RCRA location standards. This may be relevant and appropriate at the site.

2. Table 4, page 1 - Missouri PCB Treatment, Storage, Disposal facilities must meet the MO. Hazardous waste regulations chapter 13 and 7.

3. Tank systems should consider the location standards of 40 CFR 264 subpart N in accordance with 10 CSR 25-7.264(2)(J)4, pages 12 and 13.

4. Sampling methods for incineration should comply with 10 CSR 25-7.264(2)(0), page 24, where more restrictive than 40 CFR 264.343.

5. The requirements of 10 CSR 25-7.264(P) & (Q), pages 24 through 28, would be applicable to treatment or disposal facilities.

6. Leak detection and leachate collection systems must have a permeability of at least 0.01 cm/sec. [See 10 CSR 25-7.264(2)(N)2.A.(II), page 23].

7. The compliance monitoring point of 40 CFR 264.95 is modified by 10 CSR 25-7.264(2)(F)2, page 5. The establishment of this point is referenced in 40 CFR 264 subpart F (See Table 5G, page 5 and 6).

DF:rlh

SAMPLING & ANALYSIS DATA AND BORING LOGS

The records cited in entry numbers 1 through 4 may be reviewed, by appointment only, at the Weldon Spring Site Remedial Action Project, St. Charles, Missouri.

1. Chain of Custody Forms (1986 - Present)
2. Sampling Data (1940 - 1986)
3. Sampling Data (1986 - Present)
4. Boring Logs

Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

June 14, 1990

Addressees

RESPONSIVENESS SUMMARY FOR THE RI REPORT

Enclosed are two copies of the Responsiveness Summary for the Weldon Spring Chemical Plant/Raffinate Pit Remedial Investigation (RI) Report (Rev. B). The Responsiveness Summary addresses RI Report review comments from the U. S. Environmental Protection Agency (EPA), the Missouri Department of Natural Resources (MDNR), and the Missouri Department of Conservation (MDOC).

The following responses were modified to reflect the comments discussed in the March 28, 1990 meeting.

- EPA RI Report Review Comments (Enclosure A)
  - General comments 1 and 4
  - Detailed comments 17 and 28
- MDOC RI Report Review Comments (Enclosure B)
  - No change to Responsiveness Summary
- MDNR RI Report Review Comments (Enclosure C)
  - Detailed comment 10
- MDNR RI Report Review Comments (Enclosure D)
  - General comments 5 and 12

The RI will be revised to reflect conclusions of the comment responses. However, a revision to the RI will not be available until September 1990, because some minor changes may be necessary in order to assure that the RI is compatible with other environmental documents.

If you have any comments on the responsiveness summary, please respond by July 20, 1990.

Sincerely,

Stephen H. McCracken
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosures:
As Stated

cc w/o enclosure:
Action Item Log

Mr. Dan Wall
Remedial Project Manager
U. S. Environmental Protection Agency
Region VII
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Kansas City, KS 66101

David E. Bedan
Division of Environmental Quality
Missouri Department of Natural Resources
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Missouri Department of Conservation
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Mr. Daryl Roberts, Chief
Bureau of Environmental Epidemiology
State of Missouri Department of Health
Post Office Box 570
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ENGINEERS
AND
CONSTRUCTORS

MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

WELDON SPRING REMEDIAL ACTION PROJECT
ROUTE 2, HIGHWAY 94 SOUTH
ST. CHARLES, MISSOURI 63303
PHONE: (314) 441-8086

March 16, 1990

U. S. Department of Energy
Weldon Spring Site
Remedial Action Project
ATTN: Mr. S. H. McCracken
Project Manager
7295 Highway 94 South
St. Charles MO 63303

SUBJECT: Contract No. DE-AC05-86OR21548
DRAFT RESPONSIVENESS SUMMARY FOR THE RI REPORT

REFERENCE: Letter from S. H. McCracken to R. E. Hlavacek, EPA & MDNR Comments on the Draft Remedial Investigation (RI) Report for the Weldon Spring Chemical Plant/Raffinate Pit Area, March 1, 1990

Dear Mr. McCracken:

Attached please find twenty copies of the Responsiveness Summary for the Weldon Spring Chemical Plant/Raffinate Pit Remedial Investigation (RI) Report (Rev. B) for your review and comment. The Responsiveness Summary addresses RI Report review comments from the U. S. Environmental Protection Agency (EPA), the Missouri Department of Natural Resources (MDNR), and the Missouri Department of Conservation (MDOC).

As requested in your letter of March 1, 1990, the Responsiveness Summary was prepared for transmittal to EPA and MDNR/MDOC. This document was reviewed by ANL and members of the site DOE and PMC staff.

Please direct your comments to Mr. Doug Steffen of my staff.

Sincerely,

R. E. Hlavacek
Project Director

REH/mmw
Attachment

cc: Walker K. Love

LETTER5.LGO/TXTMMW

ATTACHMENT A

Comments of the U. S. Environmental Protection Agency

GENERAL COMMENTS

Comment 1:

The scope of the remedial investigation needs to be more fully defined. It may not be clear to the reader that the report is only intended to examine the contamination from the uranium processing plant, and the contamination from explosives production which is inside the DOE property lines. The rationale for this definition needs to be presented, since property lines are generally not relevent to the definition of the extent of contamination. It remains EPA's position that the DOE's and the U.S. Army's respective responsibilities must be defined in a written agreement to ensure that all needed investigation will be completed in an efficient manner. The adequacy of the scope of the RI needs to be evaluated in the context of such an agreement.

Response to Comment 1:

The scope of the Weldon Spring Site remedial investigation is presented in Section 1.1.1 where it is stated that the RI focused on both the on-site contamination associated with the chemical plant and raffinate pits, and the off-site areas also contaminated by these sources. Extensive efforts have been devoted to determining the extent of on-site and off-site contamination. DOE work has included characterization of various off-site media that may contain WSS contaminants. Data from this characterization work are presented either directly in the RI Report or in referenced documents.

DOE has assumed responsibility for investigation and remediation of all on-site soil contamination and any off-site soil contamination that is associated with a radiological source. DOE has also assumed responsibility for remediation, as required, of radiologically contaminated groundwater whether on- or off-site.

Comment 2:

The field sampling plans which were developed and implemented to form the basis of the RI Report are described in the report; however, the reader is not clearly directed to the respective sampling investigation reports which presumably contain more focused and thorough analyses than the summaries contained in the RI Report.

Response to Comment 2:

Agree. The field sampling plans are described in Section 2.2.1. The following specific references will be added to more clearly define the descriptions in Section 2.2.1:

Page 2-3, Paragraph 3, Line 1
Insert "(MKF and JEG, 1988j)"

Page 2-4, Paragraph 1, Line 2
Insert "(MKF and JEG, 1988t)"

Page 2-4, Paragraph 2, Line 1
Insert "(MKF and JEG, 1988i)"

Page 2-4, Paragraph 3, Line 2
Insert "(MKF and JEG, 1988n)"

Page 2-4, Paragraph 4, Line 1
Insert "(MKF and JEG, 1988o)"

Page 2-4, Paragraph 5, Line 3
Insert "(MKF and JEG, 1987l)"

Page 2-4, Paragraph 5, Line 3
Insert "(MKF and JEG, 1987b)"

The references discussed in Section 3, Weldon Springs Study Area Investigtions, are the investigation reports that form the basis for the RI Report. The reader will be directed to these reports by adding the following statement to Section 2.2, page 2-3, paragraph 1: "Results of these sampling programs are summarized in Section 3."

Comment 3:

A useful summary of data gap analyses and general plans for additional data collection is not presented.

Response to Comment 3:

Agree. The RI database is presently being evaluated relative to the alternative analysis for the feasibility study. Potential data gaps identified by this analysis will be summarized in the RI and general plans for additional data will be presented. DOE does anticipate collecting additional data in the following areas:

- o Soil contamination: Extent of soil contamination under the buildings, raffinate pits and Ash Pond.
- o Overburden physical characteristics: Field tests to verify hydraulic conductivity values in the vadose zone.
- o Contaminant transport and attenuation: Studies are currently being conducted by USGS/UMR to evaluate geochemical aspects of contaminant transport and attenuation.
- o Ecological studies: Studies are currently being planned to assess potential impacts to species using contaminated areas of the WSS. Data from these

studies will augment existing data from the MDOC (Busch Wildlife Area) and WSSRAP characterization programs.

Comment 4:

The data available for analysis of ecological impacts appears to be limited. The impacts of contamination on the wildlife is presented only in the context of the implications to human health. A complete baseline risk assessment must consider environmental effects as well as public health effects. Information on the numbers of species using the contaminated area, their reproductive success, and any evidence that the contamination is affecting the viability of local wildlife populations should be presented.

Response to Comment 4:

Agree. Although site-specific data are limited, extensive data exist on a regional scale related to the ecological character in the general site vicinity. The 217 acre WSS is adjacent to the 1,843 acre U.S. Army Reserve Training Area, the 6,919 acre Busch Wildlife Area, and the 7,200 acre Weldon Spring Wildlife Area. It has been our approach to utilize the local and regional data derived from these surrounding areas as the base for ecological information. This database may be augmented as a result of the data gap analyses. Planning for additional data collection both on- and off-site is currently underway.

DETAILED COMMENTS

Comment 1:

The Table of Contents should be expanded to include a list of plates.

Response to Comment 1:

Agree. This change will be made in the Table of Contents.

Comment 2:

In the Executive Summary (page 1), there is a statement which refers to the percentage of land transferred to the U.S. Atomic Energy Commission (AEC) versus the amount of land originally used for ordnance production. Ten percent is the amount quoted; whereas, the actual amount is closer to one percent as explained in Appendix H. The original site covered 17,232 acres compared to 205 acres transferred from the Department of Army (DA) to AEC.

Reponse to Comment 2:

Agree. Text in the Executive Summary (page 1, second paragraph, fifth sentence) will be changed to read: "The portion of the Weldon Spring Ordnance Works transferred to U.S. Atomic Energy Commission is about one percent..."

Comment 3:

In the third paragraph of the Executive Summary, there are statements which are contradictory. It is stated first that the Weldon Spring Raffinate Pit (WSRP) and the Weldon Spring Chemical Plant (WSCP) areas are on the National Priorities List. The next sentence states that they have been nominated to be on the List.

Response to Comment 3:

Agree. The Weldon Spring Raffinate Pit/Chemical Plant areas and the Weldon Spring Quarry area are all included on the National Priorities List. The text in the Executive Summary (page 1, third paragraph) will be changed by deleting the third sentence ("The remainder of the Weldon Spring Site, the Weldon Spring Chemical Plant and Raffinate Pit area, has been nominated to be included on the National Priorities List").

Comment 4:

On page 8 in the third paragraph, the reference to Figure 7 should be to Figure 6.

Response to Comment 4:

Agree. Figure reference in the Executive Summary (page 8, third paragraph, first sentence) will be changed to Figure 6.

Comment 5:

The first sentence of the first paragraph on page 10 should be rewritten. It appears that nitroaromatics precipitate in the unsaturated zone before reaching the saturated zone.

Response to Comment 5:

Agree. This sentence will be rewritten to read: "Nitroaromatic compounds in the groundwater are believed to enter the saturated zone by leaching from contaminated soils."

Comment 6:

Several conflicting statements were found. As an example, on page 10 in the Executive Summary, the following statement is made "Nitroaromatic compounds quickly degrade upon exposure to sunlight and therefore are not transported in surface waters." It is noted on page 6-16, Vol. I that the nitroaromatics TNB and DNB are not subject to photolytic degradation. Also, on page 1-4, the Army Reserve is 1,843 acres, while on page 3-13, Vol. I, it is approximately 1,660 acres.

Response to Comment 6:

Agree. Text will be revised by deleting the statement in the Executive Summary, page 10, that reads: "Nitroaromatic compounds quickly degrade upon exposure to sunlight and therefore are not transported in surface waters." This statement is too general in nature and is not correct as written.

Agree. Statement in Section 1.2.1, page 1-4, that presents the size of the Army Reserve property as 1,843 acres is incorrect. This figure will be changed to 1,660 acres as correctly shown in Section 3.2.3, page 3-13.

Comment 7:

On page 1-5 in the second paragraph, the text states that the Weldon Spring Wildlife Area is located across Missouri Highway 94. Figure 1.2-2, which is referenced, shows the site and the wildlife area on the same side of the highway.

Response to Comment 7:

Agree. Figure 1.2-2 is correct. The text describing the location of the Weldon Spring Wildlife Area (Section 1.2.1, page 1-5, second paragraph, first sentence) will be revised as follows: "The Weldon Spring Wildlife Area (Weldon Area) is located to the south of the WSS (Figure 1.2-2) and consists of approximately 2,900 ha (7,200 ac)."

Comment 8:

Numerous abbreviations labeling buildings, water towers, etc., are shown on Plate 1. A legend should be provided to identify the structures.

Response to Comment 8:

Agree. A legend will be provided on Plate 1 to identify these structures.

Comment 9:

Table 3.7-1 should indicate what the numbers on the table represent such as the number of samples taken.

Response to Comment 9:

Agree. The numbers in Table 3.7-1 indicate how many geotechnical tests of a given type were performed by each organization at WSSRAP. A heading "Number of Tests Performed", will be added within Table 3.7-1 to more clearly indicate the meaning of the data.

Comment 10:

In Section 4.5.1, page 4-33, second paragraph, it is concluded that the observed net infiltration in the raffinate ponds is "closely related" to the measured hydraulic conductivities of the underlying material. In fact, those hydraulic conductivities span four orders of magnitude. The magnitude of the measured net infiltration lies in the middle of that range. While this is to be expected, it may be misleading to use the term "closely related" to characterize this agreement.

Response to Comment 10:

Agree. Text on page 4-33, Section 4.5.1, second paragraph, last sentence, will be reworded to read: "The magnitude of the measured losses from the pits corresponds to a soil permeability of approximately 1.0×10^{-6} cm/sec which is an order of magnitude greater than the median laboratory value for saturated hyraulic conductivities at the site. Laboratory values for saturated overburden hydraulic conductivity range from 1.6×10^{-9} to 2.0×10^{-5} cm/sec (4.5×10^{-6} ft/day to 5.7×10^{-2} ft/day) (BNI, 1986a)."

Comment 11:

The discussion on stratigraphy is good; however, we suggest that the surface soils be addressed in terms of the Department of Agriculture's soil series and descriptions.

Response to Comment 11:

Field logging and laboratory classification was based on the Unified Soil Classification System which is more commonly used in performing engineering studies. Use of the USDA classification system will be considered for future studies.

Comment 12:

Page 4-1 references Figure 4.1-2 for site elevations, but it only shows elevations for the surrounding area.

Response to Comment 12:

Agree. A new Figure 4.1-3 will be drafted which will show site elevations. The reference in Section 4.1, page 4-1, paragraph 3, first sentence will be changed to Figure 4.1-3.

Comment 13:

The term "normal" is also used incorrectly. In meteorology, "normal" refers to averages of climatological data for the 30-year period from 1951 through 1980. In the context used in the report, either the term "average" or "mean" is more appropriate.

Response to Comment 13:

Agree. The text will be revised to strike the term "normal" and use "average" instead (Section 4.2, page 4-3, paragraph 4, second sentence).

Comment 14:

The legend on Figure 4.3-2 should include a description of the well, trench and borehole numbering system.

Response to Comment 14:

Agree. However, this information is too bulky to include in a figure. A new Table 4.3-1 will be added and titled "Well, Trench, and Borehole Numbering System Description", to indicate the various numbering conventions which have been employed at the Weldon Spring Site.

A sentence will be added to the last paragraph on page 4-10 (Section 4.3.1.2) following "...in a given borehole." that will read: "Table 4.3-1 lists the borehole and trench numbering conventions."

The first sentence at the top of page 4-11 (Section 4.3.1.2) that currently begins "Table 4.3-1 presents a list..." will be changed to read: "Table 4.3-2 presents a list...".

Comment 15:

In the first paragraph on page 4-21, the last sentence indicates that the four raffinate pits do not contribute to direct runoff; however, Figure 4.4-2 seems to show flow out of pit number 4. Table 4.4-2 also indicates the raffinate pits are closed basins, but Figure 4.4-3 seems to show a stream gage that measures the outflow from pit 4.

Response to Comment 15:

Agree. Figure 4.4-2 does appear to indicate outflow. This is misleading as Pit 4 does not discharge surface runoff. Figure 4.4-2 will be corrected by moving the arrow west of Pit 4.

Agree that Figure 4.4-3 is similarly misleading. As correctly indicated in Table 4.4-2, the raffinate pits are closed basins. The stream gage NP-004 shown in Figure 4.4-3 does not measure outflow from Pit 4, as there is none. Figure 4.4-3 will be corrected by moving the arrow west of Pit 4.

Comment 16:

The term "swallow holes" appears occasionally. Pages 4-26, 4-30 and 4-31 refer to "swallow holes" and Figures 4.4-4 and 4.4-11 refer to "shallow holes." Definitions should be provided since it is not clear what these holes are.

Response to Comment 16:

Agree. Text will be revised by adding a short definition on page 4-26 which will generically describe a swallow hole. On page 4-26, Section 4.4.4.1, second paragraph, after the second sentence and before "The 5000 series...", the following sentence will be added: "A swallow hole is a point in a stream bed where a sinking stream loses its discharge to the subsurface (White, 1988)."

The term "shallow hole" on Figure 4.4-4 is a typographical error and will be changed to "swallow hole". Figure 4.4-11 is correct as labeled.

Comment 17:

The method used for estimating surface runoff on page 4-24 is not a very reliable one. A better approach would have been to calibrate a model to the measured events, then use a historical sequence of precipitation events to determine average runoff conditions. An alterntive approach would be examine records from similar gaged watersheds in the area.

Response to Comment 17:

The USGS has recently completed a water budget study on a 4.6 square mile area which includes two Mississippi River subdrainages immediately northwest of the WSCP/WSRP site. Preparation of a data report is in progress and an interpretive report is expected about May, 1990 (M.J. Kleeschulte, personal communication, 1990).

Results of this study will be incorporated into estimates of average discharge volumes at Weldon Spring Site NPDES discharge points.

Comment 18:

On page 4-31, the definition of the vadose zone is misleading. The vadose zone may be temporarily saturated due to surface ponding and may have perched water tables. Perched water tables are mentioned on page 6-4. A possible definition is the zone between the soil surface and the permanently saturated zone.

Response to Comment 18:

Agree. Text will be changed by striking the first sentence of Section 4.5, page 4-31, and inserting the following in its place: "The geological profile extending from the ground surface to the phreatic surface is called the vadose zone. The term "vadose zone" is preferable to the term "unsaturated zone" because saturated conditions may be locally present in the form of perched groundwater and unsaturated flow due to infiltration, seepage, or percolation."

Comment 19:

On page 4-33, there is a discussion about lysimeters and that they were installed to determine possible contaminant migration. More explanation is needed to explain how a lysimeter would show contaminant migration. The discussion on page 5-141 about lysimeters is even more confusing on just how the lysimeters are being used. On Table 5.4-1, lysimeter LYS3506 should be LYS3606.

Response to Comment 19:

Agree. Text on page 4-33, Section 4.5.1, third paragraph, second sentence, will be changed to read: "Lysimeters, sometimes called soil-moisture samplers, are commonly used to sample soil-pore liquids in unsaturated media. The ten

lysimeters were installed by UNC Geotech in July 1987 as part of a preliminary assessment of contaminant transport by unsaturated flow in the vicinity of the raffinate pits. The lysimeters were installed in locations where seepage from the raffinate pits was expected to be encountered in the form of unsaturated flow in the vadose zone."

Sentence 3 of paragraph 1, Page 5-141, Section 5.4.1, will be changed to read: "Wells MW-3013 and MW-3018 also monitor the quality of perched and mounded water within the overburden."

On Table 5.4-1, the heading "LYS3506" will be changed to "LYS3606."

Comment 20:

The second paragraph on page 4-35 refers to Figure 4.5-5 when it should really be 4.5-6.

Response to Comment 20:

Agree. The reference on page 4-35 (Section 4.5.1, second paragraph, fourth line) will be changed from Figure 4.5-5 to Figure 4.5-4; this is the correct reference.

Comment 21:

On page 4-40 in the third paragraph, briefly explain why the Bouwer and Rice method is believed to be the more reliable method.

Response to Comment 21:

Agree. Text changes will be made to include an explanation. The fifth sentence of the third paragraph on page 4-40, Section 4.6.2.1, will be deleted and replaced with the following:

"The Bouwer and Rice method is believed to be more reliable for calculating in situ hydraulic conductivities than the Hvorslev method due to the difference in methodologies used to determine the effective radius of influence for a test occurrence (i.e. the radius over which head loss or gain is dissipated). Bouwer and Rice (1976) pointed out that the Hvorslev method, in most cases, assumes that the effective radius of influence is equal to the distance from the bottom of the well to the potentiometric surface. However, in reality, the effective radius of influence is considerably less than the distance from the bottom of the well to the potentiometric surface. Bower and Rice used an electrical resistance network analog to determine the effective radius of influence for different slug test geometries. An empirical equation was then developed to relate the effective radius of influence to the geometry of the well and the aquifer. This technique is applicable to determining the effective radius of influence for partially penetrating and fully penetrating wells in unconfined aquifers. It can also be used to estimate the hydraulic conductivity of confined aquifers that receive water from the upper confining layer through recharge or compression.

"With this in mind, the Bouwer and Rice method was used to analyze all data because it is considered to more closely simulate Weldon Spring Site conditions. The Hvorslev technique was used because its widespread industry use allows comparison of WSS data with other data analyzed by that method."

Comment 22:

The loss by seepage from the raffinate pits should be reported as a volume per unit of time. The second paragraph on page 4-47 only specifies an apparent velocity.

Response to Comment 22:

Agree. Text on page 4-47, Section 4.6.3.1, second paragraph, fourth sentence, will be changed to read: "The water balance study at the raffinate pits indicated average losses of 6.16m^3/d for Pit 2 to 50.13 m^3/d for Pit 3 due to seepage (BNI, 1987)."

Comment 23:

In Chapter 5, many concentrations are discussed in various samples. Generally, these concentrations are not referenced with any standard to indicate if the concentration is significant in terms of human health or the environment. Page 5-16 has numerous examples of this. Page 5-22, last paragraph, provides the kind of comparison to an established standard that would be helpful throughout the document.

Response to Comment 23:

Tables and figures are presented in Vol. II that compare background concentrations in soils and water quality standards to the analytical results for soils, sediments, surface water, and groundwater (see Figures. 5.2-1 through 5.2-30 and Tables 5.2-2 through 5.2-31, 5.3-1, and 5.4-2). Because of the extensive amount of information presented, it was determined that the most effective means of presenting these comparisons is in tabular form.

The presence of contamination in any medium does not by itself necessarily indicate risk to human health or the environment. The determination of risk is also dependent upon exposure to the contaminants. Exposure pathway analyses and dose calculations were made as part of the baseline risk assessment. Details of these calculations are provided in the Site Baseline Risk Assessment Report. A summary is also provided in chapter 7 of the Site Remedial Investigation Report. In addition, the Site FS-EIS will include a risk analysis.

Comment 24:

An inconsistency was noted in Section 5.1.2.3, page 5-14, second paragraph. The report indicates that the evaporation of all water from raffinate pits 1 and 2 has not happened since 1980; however, Table 5.1-16 indicates a dry surface in 1987. A clarification is needed.

Response to Comment 24:

Agree. The "Surface Water Volume" entries in Table 5.1-16 will be changed from "dry surface" to "$<5{,}000\ m^3$".

Comment 25:

Tables 5.1-6 and 5.1-7 have the same title. One of them should be changed to reflect the differences in the data presented.

Response to Comment 25:

Agree. The title of Table 5.1-6 will be changed to "Compilation of Asbestos Data, Samples with Suspected Radiological Contamination". The title of Table 5.1-7 will be changed to "Compilation of Asbestos Data, Samples Not Suspected to be Radiologically Contaminated". Title notations in the table of contents for Volume I and Volume II will also be changed.

Comment 26:

Section 3 of the report describes the investigations conducted at the site. To keep the report consistent, we suggest that the radiological investigations be described in that section as well, rather than in Section 5.

Response to Comment 26:

Agree. Descriptions of radiological investigations will be moved from Section 5 to Section 3.

Comment 27:

On Tables 5.2-2 through 5.2-31, there does not appear to be any difference between the constituents labeled "Other contaminants at levels about two times their upper background limit" and those labeled "...above their upper background limit."

Response to Comment 27:

Agree. Tables 5.2-2 through 5.2-31 will be corrected.

Comment 28:

The last paragraph on page 6-7 uses a comparison of Figures 4.6-3 and 4.6-4 to indicate a deep ground water "trough" extending from the Weldon Spring site to the Burgermeister Spring. It is suggested that conduit flow velocities in this "trough" are on the order of two feet per minute. This velocity is several orders of magnitude greater than any other reported velocities in the area. Because of this and the

potential for very rapid offsite migration of contaminants, there should be more discussion about this "trough." How were these velocities calculated? How does the comparison of the two figures lead to the conclusion of a deep "trough"? The discussion which continues onto page 6-B appears to contradict this conclusion. This paragraph is confusing and needs clarification.

Response to Comment 28:

Agree. The groundwater flow velocities in the conduit system discussed in this paragraph are based on MDNR dye studies. Results of these studies are presented in Section 4.4.4.3, page 4-30. The dye was carried approximately 1,980 m (6,500 ft) in 40 to 72 hours. The velocity figures presented in Section 6.1.3.2, page 6-7, will be presented on page 4-30. The text in on page 4-30, Section 4.4.4.3, second paragraph, third sentence, will be revised to read: "The time of travel is estimated to be 48 to 72 hours, indicating flow velocities of 0.76 to 1.1 cm/sec (1.5 to 2.2 ft/min), depending on rainfall conditions (Dean, 1984a)."

The text in Section 6.1.3.2 will be revised as follows: The paragraph beginning at the bottom of page 6-7 and continuing onto page 6-8 will be deleted and replaced with this paragraph:

Figure 4.6-3 illustrates the potentiometric surface of the water table aquifer in the vicinity of the WSCP. The prominent feature of the potentiometric surface is a linear depression which extends from the area west of the WSCP northward toward Burgermeister Spring and Lake 34. Figure 4.6-5 is a potentiometric map of the water table aquifer in the WSCP/WSRP areas. The steep potentiometric gradient near MW-4002 and the linear depression in Figure 4.6-3 are inferred to be a function of both surface relief and conduit flow. The axis of the linear depression closely follows the surface drainage pattern. The MDNR conducted ground water dye tracing tests which confirmed the presence of conduit flow within the area of the linear depression. Figure 6.1-1 illustrates the locations where the dye traces were conducted and the places to which the conduits flowed. The potentiometric linear depression is present because water normally in storage within the pore spaces of the water table aquifer is being drained by conduit flow. Conduit flow by its nature is orders of magnitude greater than the predominant Darcian laminar flow in the nonhomogeneous, antisotropic porous medium limestone aquifer.

Comment 29:

The discussion on the factors affecting the persistence and attenuation of organic compounds should be expanded. Sometimes degradation products are more toxic than the parents. Were the degradation products adequately sampled and analyzed?

Response to Comment 29:

The section describing contaminant persistence and attenuation for nitroaromatic compounds (Section 6.2.7) in the RI Report will be rewritten to include more detailed information on factors affecting the environmental fate of TNT, DNT, NB, TNB and DNB. The environmental fate for some of these compounds is also discussed in Appendix A of Vol. III. In a chemical characterization survey of the

quarry conducted by BNI from October to December 1984 and May 1985, soil and sediment samples were analyzed for 2,6- diamino - 4 - nitrotoluene and 2,4-diamino - 6 - nitrotoluene, known biotransformation products from TNT. Results of this survey indicated the presence of these potential biotransformation products in several samples. No other efforts have been made to test for the presence of biotransformation products.

The rewritten section 6.2.7 is as follows:

6.2.7.1 2,4,6-TNT

2,4,6 TNT is almost insoluble in water, sparingly soluble in alcohol, and readily soluble in benzene, toluene and acetone. Upon exposure to sunlight or ultraviolet light, decomposition of TNT in water occurs by a process known as photolysis. The rate of photolysis is accelerated by the products formed during the photolytic process as well as the presence of other natural substances. Humic substances in natural water are also subject to photolysis, yielding hydrogen ions and hydroxyl radicals that can reduce organic compounds. Nitrate ions in water can also promote photochemical oxidation of trace organic compounds through production of hydroxyl radicals. The half-life of TNT in natural surface waters due to photolysis is estimated to be between 3 and 22 hours (Spanggord et al., 1980).

The primary photodegradation product of 2,4,6 TNT is 1,3,5-trinitrobenzene; other by-products include 2,4,6-trinitrobenzonitrite and 1,3,5-trinitrobenzaldehyde (U.S. Army, 1986a). These photoproducts will readily volatilize from sediments and water (Cullahan, 1979). However, based on the relatively low Henry's Law constant for 2,4,6-TNT, (0.18 torr M^{-1}), volatilization is not an expected pathway for attenuation of 2,4,6-TNT (Spanggord et al., 1980).

The tendency for 2,4,6-TNT to adsorb to soils is primarily dependent upon the organic content of the soil (U.S. Army, 1986b). Due to the extremely low organic content of the Ferrelview and clay till formations, adsorption is not expected to be an important retardation factor in WSS soils. Minimal adsorption is expected on carbonate minerals and chert in the limestones, so dispersion and dilution are the most likely mechanisms by which TNT concentrations will decrease in the bedrock aquifer.

The biotransformation of 2,4,6-TNT in natural waters is very slow, even in the presence of organic nutrients (Spanggord et al., 1980). The half-life for biotransformation of 2,4,6-TNT in surface waters is estimated to be 8-25 days, which is far longer than for photolysis (Burlison, 1980). Hence the fate of TNT in surface water will primarily be controlled through photolysis.

The biotransformation process for 2,4,6-TNT involves reduction of the nitrogroups through the nitroso and hydroxyl amino to either amines or azoxy dimers. Transformation of TNT in soil is known to occur under both aerobic and anaerobic conditions by bacteria and fungi. Biotransformation products can include the following:

4-amino - 2,6-dinitrotoluene
2-amino - 4,6-dintrotoluene
2,6-diamino - 4-nitrotoluene
2,4-diamino - 6-nitrotoluene
4-hydroxylamino - 2,4-dinitrotoluene
2,2', 6,6'-tetranitro - 4,4' azoxytoluene
4,4', 6,6'-tetranitro - 2,2' azoxytoluene
2,4,6-trinitrotoluene (McCormick, 1976; Won, 1974)

Many of these compounds are more hazardous and soluble than the parent compound 2,4,6-TNT. Accumulation of the biotransformation products can be inhibitory to soil microorganisms, hence reducing the rate of transformation.

The environmental factors shown to affect the rate of TNT transformation include initial TNT concentration, soil moisture, the presence of microorganisms, temperature, and oxygen levels. Of these factors, the initial concentration of TNT has the greatest overall effect on the rates of biotransformation; the greatest biotransformation rates occur at very low concentrations of TNT (0.1%), with progressively slower transformation rates occuring at 1% and 10% concentration of TNT (Kaplan et al., 1985).

After TNT concentration, the presence or absence of microorganisms and temperature has the greatest effect. Moisture level is less important, and organic matter and oxygen levels are insignificant in affecting the rate of biotransformation. However, the presence or absence of oxygen does alter the biotransformation products. Under anaerobic conditions, increased production of triamines occurs over aerobic conditions. Aerobic conditions lead to the formation of diamines and monoamines.

6.2.7.2 1,3,5 TNB and 1,3 DNB

TNB detected at the WSS is probably the product of oxidation of the methyl group of TNT by photolysis. It is essentially insoluble in water, sparingly soluble in hot alcohol, and readily soluble in acetone, ether, and benzene. It is a very stable compound; it is resistant to hydrolysis and is not photolytically or biochemically degraded or transformed as readily as TNT.

TNB is more volatile than TNT (See Table 6.2-1) by nearly one order of magnitude (half-life is approximately 130 days) hence, volatilization from surface waters is expected to be a major fate process. The estimated value of K_{OC}, the sorption partition coefficient based on organic carbon content, is 520, suggesting that adsorption on sediments and soils with a sufficient organic fraction may be a significant environmental fate. However, due to the very limited organic content of the WSS soils, adsorption is probably not a major factor in retarding migration of TNB. Volatilization from soils is also not considered a significant factor affecting the persistence of TNB in soil.

1,3 DNB is sparingly soluble in water and slightly less volatile than TNB (Table 6.2-1). Volatilization from surface waters is considered an important fate process. Although studies have shown that DNB is subject to photolysis, the rate of volatilization is much higher; hence photolysis is not considered to be a significant environmental fate.

The sorption partition coefficient, K_{OC}, is estimated to be 64, which indicates soil sorption is not expected to be an important fate for 1,3-DNB.

It has been reported that 1,3-DNB is resistant to attack by soil microorganisms (Alexander and Lustigman, 1966), but is nearly completely degraded in a two-stage model waste water treatment system (Bringman and Kuehn, 1971). Laboratory studies performed by McCormick (1978) using an enzyme preparation of V. alalescenes demonstrated that 1,3-DNB and 1,3,5 TNB were reduced by hydrogen.

6.2.7.3 2,4 and 2,6 DNT

2,4-DNT and 2,6-DNT are formed as impurities and intermediates during the production of TNT. They are sparingly soluble in water, alcohol, and ether, but readily soluble in acetone and benzene. Based on calculated soil adsorption coefficients (Spanggord et al., 1980) these compounds are expected to have only a slight tendancy to sorb to soils, sediments and suspended solids. Some biotransformation in soil may occur in both the aerobic and anaerobic zones. In natural water systems, large amounts of supplemental carbon are needed for biotransformation to occur. Photolysis in water systems is rapid and is probably the most important removal process for DNT in surface waters. Volatilization may be a significant factor for 2,6-DNT in surface water but not for 2,4-DNT; neither compound is expected to volatilize from soils.

The biotransformation products of DNT are the aromatic amines and aminonitrotoluenes, and include the following:

2-nitroso - 4-nitrotoluene
2-amino - 4-nitrotoluene
4-amino - 2-nitrotoluene
4-nitroso - 2-nitrotoluene
2,2'-dinitro - 4,4' azoxytoluene
4,4'-dinitro - 2,2'-azoxytoluene
4-acetamino - 2-nitrotoluene
4-methyl - 3-nitroaniline
2-methyl - 5-nitroamine (McCormick et al., 1978)

Many of the biotransformation products are toxic and inhibit the biotransformation process. With sufficient supplemental carbon, the anaerobic biotransformation process proceeds much faster than the aerobic process, and tends to favor production of the amine 2-methyl - 5-nitroamine.

Both isomers of DNT rapidly photolyze in ultraviolet light or sunlight. Photolysis of 2,4-DNT results in production of the following compounds (Burlinson and Glover, 1977):

2,4-dinitrobenzaldehyde
2-amino - 4-nitrobenzaldehyde
2,2'-carboxaldehyde - 5,5'-dinitroazoxybenzene
2,4-dinitrobenzoic acid
2-amino - 4-nitrobenzoic acid
2,2'-carboxy - 5,5' dinitroazoxybenzene

The nitrobenzoic acids may be further broken down into other products such as 1,3-dinitrobenzene. The final products of reaction are carbon dioxide, water, and nitric acid.

The photolysis half-life in sunlight for 2,4-DNT is estimated to be between 2 to 10 hours, depending upon the amount of humic substances present and concentration of activated transformation products. These factors can accelerate the rate of photolysis by 1.3 - 2.5 times (Simmons and Zepp, 1986).

The photolysis half-life for 2,6-DNT is 12 minutes by indirect photoreaction. The rate is affected by the presence of humic materials in natural waters, which can accelerate photodecomposition 11-17 times (Mill and Mabey, 1985; Simmons and Zepp, 1986)

The half-life of 2,4-DNT in water by volatilization is estimated to be 410 days (Spanggord et al., 1980); hence, volatilization is not considered a significant environmental fate for 2,4-DNT. On the other hand, the volatilization half-life of 2,6-DNT is 140 days (Spanggord et al., 1980) which indicates this process is an important fate process for 2,6 DNT.

6.2.7.4 Nitrobenzene

Nitrobenzene is moderately soluble in water, and has a moderate tendency to sorb on soils and sediments. Greater adsorption is associated with soils and sediments which have high organic fractions. Nitrobenzene can be expected to leach into the ground from a release on land and degrade within a few months as biodegradation in both aerobic and anaerobic environments can be significant. Reduction of the NO_2 group of the NB ring may be an important degradation process in groundwater under the reducing conditions occurring in the groundwater beneath the site. NB in surface waters is also subject to photolysis; the main photoproducts are azobenzene and anailine (Barltrop and Bunce 1968). The photolysis half-life of NB is estimated to be 133 days. The half-life can be accelerated by 1-3 times due to the presence of humic substances and nitrate ions (Simmons and Zepp, 1986).

Alexander, M. and B.D. Lustigman, 1966. Effect of Chemical Structure on Microbial Degradation of Substituted Benzenes. J. Agr. Food Chem. 14(4):410-13.

Barltrop J.A. and N.J. Bunce, 1968. Journal Chem Soc Section C. pp. 1467-74.

Bringman, G., and R. Kuehn, 1971. Biological Decomposition of Nitrotoluenes and Nitrobenzenes by Azotobacter Agilis. Gesundh.-Ing. 92(9):273-6. (Ger.).

Burlinson, N.E. and D.J. Glover, 1977. Photochemistry of TNT and Related Nitrobodies. Quarterly Progress Report No. 12, for 1 April to 30 June 1977. Explosive Chemistry Branch, Naval Surface Weapons Center, Silver Spring, MD.

Cullahan, Michael A. et al., 1979. Water-Related Environmental Fate of 129 Priority Pollutants. Washington D.C.: U.S. Environmental Protection Agency. EPA 440/4-79-029.

Kaplan, D.L. et al., 1985. Effects of Environmental Factors on the Transformation of 2,4,6-Trinitrotoluene in Soils. U.S. Army Natick Research and Development Center. Technical Report Natick/TR-85/052, January.

McCormick, N.G., J.H. Cornell, and A.M. Kaplan, 1978. Identification of Biotransformation Products From 2,4-dinitrotoluene. Appl. Environ. Microbiol. 35(5):945-948.

Mill, T.and W. Mabey, 1985. Environmental Toxicology Chemistry 1:175-216.

Simmons, M.S. and R.G. Zepp, 1986. Water Resources 20:899-904.

Spangoord R.J., T. Mill, T.W. Chou, W.R. Mabey, J.H. Smith, and S. Lee, 1980. Environmental Fate Studies on Certain Munition Waste Water Constituents. Final Report, Phase II - Laboratory Studies. SRI International, Menlo Park, CA. DAMD 17-78-C-8081.

U.S. Army Toxic and Hazardous Materials Agency, 1986a. Summary Remedial Investigation/Feasbility Study. Aberdene Proving Ground, MD. Final Report. Cornhusker Army Ammunition Plant.

U.S. Army Toxic and Hazardous Materials Agency, 1986b. West Virginia Ordnance Works: Endangerment Assessment for Sewer Lines, the TNT Manufacturing Area, and the Burning Grounds. Prepared by Environmental Science and Engineering, Inc. Florida. Aberdeen Proving Ground, MD. Final Report.

Comment 30:

On page 6-16 in the first sentence of Section 6.2.7.2, change "deleted" to detected".

Response to Comment 30:

Agree. Text in Section 6.2.7.2, page 6-16, first paragraph, line 1, will be changed to read: "TNB detected at the WSS is probably the product of oxidation of the methyl group of TNT by photolysis."

Comment 31:

From January 1967 to February 1969, the Department of the Army prepared plans to design and construct a plant at the site to produce the herbicide "agent orange". This fact is mentioned in the appendix, but the appendix does not indicate that there was no actual production of the herbicide at the Weldon Spring site during that two-year period.

Response to Comment 31:

Agree. Text on page H-5 of Appendix H will be revised by inserting the following sentence between the second and third sentences in entry Feb. 1969: "No herbicide production occurred."

Comment 32:

Important information appears missing from the appendices. Descriptions of the monitoring well construction and sampling techniques should have been included.

Response to Comment 32:

Agree. Monitoring well completion diagrams should be published along with the borehole logs for the wells. However, these diagrams and logs have not been included in the RI Report because of the excessive bulk they would add. At this time, no plans exist to publish these logs. However, the logs are to be compiled in a compendium of geologic data which will be available for review at the Weldon Spring Site.

Sampling techniques are described in the Hydrogeologic Investigations Sampling Plan. This document is indirectly referenced on page 2-4, Section 2.2.1 of the RI Report. The reference to this and other sampling plans will be more clearly defined by revising the text in Section 2.2.1 as indicated in the response to General Comment 2 of this attachment.

ATTACHMENT B

Comments of the Missouri Department of Conservation

GENERAL COMMENTS

Comment 1:

Page 5-112 through 5-122. It appears that the Department of Conservation sites 1, 3, 4, 5, 7 and 9 require remediation while sites 2, 6, 8 and 10 apparently do not require remediation. Sites 1, 2 and 10 apparently have been cleaned up. Site 6 is recommended to be remediated during quarry cleanup. Why not include site 8 in the remediation of quarry cleanup?

Response to Comment 1:

Site 8 will be remediated during bulk waste removal to a level that assures proper worker protection in the quarry support area. The final verification of remediation will be performed as a part of the follow-on quarry cleanup after bulk waste removal to a level consistant with unrestricted use in that area.

Comment 2:

Page 5-123. We concur in the need for cleanup of Southeast Drainage.

Response to Comment 2:

Comment is noted. As stated in the report text, the Southeast Drainage will be characterized after major site remedial actions are completed and may be remediated as part of the final soil and pit cleanup. However, before a decision to remediate the Southeast Drainage is made, the potential environmental damage to the area will be weighed against the risks posed if the area is not remediated.

Comment 3:

Page 5-132. Sediment samples from site SD-4001, Lake 36, SD-4007 and Lake 35 have mean uranium levels of 31 pCi/g, 30 pCi/g, 26 pCi/g and 23.6 pCi/g. The reference level for uranium indicated on page 5 of the Executive Summary is 15 pCi/g. Would it follow that remediation on these sites is warranted since they exceed the reference level?

Response to Comment 3:

The decision on remediation of the sites in question will be made after final cleanup criteria are established. Page 5 of the Executive Summary does not adequately

explain the purpose of reference levels as used in the RI. The following explanation will be included as a new paragraph in the Executive Summary, page 5, and will become the fourth paragraph in Contaminant Sources:

"It is important to understand that the radionuclide reference levels presented here are not intended to guide site remediation. The reference levels were used because site-specific cleanup guidelines have not yet been developed for the WSS. The RI presents reference levels only for the purpose of estimating area and volumes of soil containing radionuclide concentrations. Once final cleanup guidelines have been established, the estimated areas and volumes will be revised. Pages 5-45 and 5-46 of the RI provide further detail as to the purpose and justification of reference levels."

Comment 4:

Page 5-155 and 5-157. Data are puzzling to us. We have collected a set of fish flesh samples for lead analyses. We would hope that as more data become available a decision can be made on appropriate action to respond to elevated lead levels. With very high lead levels in Ash Pond and upstream of Lake 36, how will the Department of Energy interact with the Department of Army on cleanup activities?

Response to Comment 4:

DOE is very interested in the results of the MDOC fish analyses for lead. DOE will continue to coordinate its work in the Busch Wildlife Area with the MDOC in order to establish the nature and extent of lead contamination or other constitutents that may originate at the Weldon Spring Site. As part of the ongoing effort to determine the extent of WSS contamination, DOE is continuing its plans to perform media and biological characterization in conjunction with MDOC sampling in the Busch Wildlife Area. Routine monitoring activities at the Weldon Spring Site are also ongoing in order to provide a better definition of contaminant discharges. Although isolated soil locations with high lead concentrations exist at the WSS, samples collected from surface water monitoring locations during 1987 and 1988 indicate that no lead is being discharged from the site. Samples collected during lake and stream sediment characterization (MKF and JEG, 1989h) showed little difference in lead concentrations between Lakes 34, 35, 36 and 37 (background lake). It should be noted that Lake 37 is in a drainage basin that does not carry runoff from the Weldon Spring Site.

ATTACHMENT C

Comments of the Missouri Department of Natural Resources

GENERAL COMMENTS

Comment 1:

Please reference MDNR's First Annual Report on the Shallow Groundwater Investigations at Weldon Spring, Missouri as MDNR, 1989 rather than Hoffman, 1989. Citations occur on pages 4-24, 26, 46, 50 and 51, on Table 4.6-9, and perhaps elsewhere.

Response to Comment 1:

Agree. References to this report will be changed throughout Section 4.0 from "Hoffman, 1989" to "MDNR, 1989" on pages:

4-24, paragraph 3, last line.
4-26, paragraph 4, line 3.
4-46, paragraph 1, last line.
4-50, paragraph 3, last line.
4-51, paragraph 2, last line.
Table 4.6-9 footnote "d".

A search will also be conducted for this reference in the other report sections.

Entry 3 on page 4 of the Reference Section in Volume I will be changed from "Hoffman, 1989" to "MDNR, 1989. First Annual Report on Shallow Groundwater Investigations at Weldon Spring, Missouri."

Comment 2:

Figure 4.1-2 presents a topographic map of the Weldon Spring area but is not detailed with respect to the site. Nowhere else is there a topographic map of the site. We would suggest adding a topographic map of the site at the same general scale as many of the other site maps in the report. Drainage patterns and surface features would be much more obvious with such a map in combination with the text descriptions.

Response to Comment 2:

Agree. A new Figure 4.1-3 will be drafted which will consist of a site topographic map at approximately the same scale as the other site maps. The present Figure 4.1-3 will be renumbered to become Figure 4.1-4.

DETAILED COMMENTS

Comment 1:

Table 4.6-1 - footnote (f) is not explained.

Response to Comment 1:

Agree. This is a typographical error, "(f)" will be replaced with "(d)" in last footnote.

Comment 2:

Page 3-22 - MDNR Dye Tracing Studies - this section does not report MDNR-DGLS dye tracing experiments correctly. Only two borehole dye traces were attempted in 1983 (MW-2020, March 9; MW-3007, April 7) by Dean. The report only mentions one losing stream dye trace (from West Raffinate Pit Drainage, Feb. 1984) of three conducted. The other two were from the head of the Southeast Drainage (June 1984) and from Ash Pond Drainage (March 1985). The 1985 attempted borehole traces are adequately described. Fig. 3.4-4, Water Tracing Sample Locations, appears to be a modified version of a map produced by MDNR-DGLS (MDNR, 1989).

Response to Comment 2:

Agree. Section 3.4.4, paragraph 1, sentence 2, will be revised to read: "...dyes were injected into two boreholes (MW-2020 and MW-3007)..."

Agree. Section 3.4.4, paragraph 2, will be revised to read: "Dye was placed in a surface drainage west of Raffinate Pit 4 in February 1984 and west of Ash Pond in March 1985. These drainages are unnamed tributaries to the Schote Creek drainage to Lake 35. In November 1984, MDNR-DGLS also released dye at the sewer outfall at the head of the Southeast Drainage. The summary of the dye trace results can be found in the MDNR-DGLS, 1989, Shallow Groundwater Investigation Phase I Report. (MDNR, 1989)."

Figure 3.4-4 will be modified to indicate "MDNR, 1989" rather than "MKF & JEG, 1988" as the source.

Comment 3:

Page 3-29, Section 3.7.1.6 - This section mentions recent (1988-1989) exploration programs, to help describe site geology, conducted by the PMC. Some information from these programs is presented in tabular form (Table 4.3-1) but drilling logs are not presented in the RI Report. Are drilling logs from these recent programs presented in another document?

Response to Comment 3:

These logs were not included as an RI Report appendix because of the bulk they would add. Although there are currently no plans to publish these logs in document form, the logs are to be compiled in a compendium of geologic data which will be available for public review at the Weldon Spring Site.

Comment 4:

Page 4-9, Section 4.3.1.1 - The Bushberg Sandstone has been reported in the literature as a Devonian age formation (Kleeschulte and Emmett, 1987; Miller, et al, 1974; Koenig, 1961). However, more recently the Bushberg has been assigned to the Mississippian System (Thompson, 1986). The text and Figure 4.3-1 should reflect current understanding.

Response to Comment 4:

Agree. Text on page 4-9, Section 4.3.1.1, second paragraph, first sentence, will be changed to read: "The sequence from the Bushberg Sandstone unit of the Lower Mississippian system to the Burlington and Keokuk Limestones form the shallow bedrock aquifer."

The fifth sentence will also be changed to read: "The Chouteau Limestone unconformably overlies the Bushberg Sandstone."

Figure 4.3-1 will be altered to indicate that the Bushberg Sandstone is Mississippian rather than Devonian in age.

Comment 5:

The term "unit" is not customarily capitalized since it is not part of the formal name of a formation. Unit is capitalized several places on this page.

Response to Comment 5:

Agree. The term "unit" will be changed from upper to lower case in the following text of Section 4.3.1.1, on page 4-9: paragraph 2, line 1 to line 7; paragraph 3, line 1; and paragraph 4, line 2. Other report sections will also be searched and this terminology change made as required.

Comment 6:

The thickness figures given for the Warsaw and Salem formations do not agree with those given in Figure 4.3-1. The thickness figures in the text refer to the site area for most formations. The descriptions of the Warsaw and Salem do not, and may mislead the reader.

Response to Comment 6:

Agree. The last sentence of paragraph 5, page 4-9, Section 4.3.1.1, will be changed to read: "In the vicinity of the Weldon Spring Site, the Warsaw Formation ranges in thickness from 18.3 - 24.4m (60-80 ft) (Whitfield et al., 1989)."

Paragraph 6 of page 4-9, Section 4.3.1.1, will be revised to read: "In the vicinity of the Weldon Spring Site, the Salem Formation ranges in thickness to 4.5m (15 ft) (Whitfield et al., 1989). The Salem Formation is a light gray...".

Comment 7:

Page 4-10, paragraph 2 - Alluvium overlies units other than glacial drift and loess in the vicinity of the site. The last sentence of this paragraph is incorrect.

Response to Comment 7:

Agree. The last sentence of paragraph 2, page 4-10, Section 4.3.1.1, will be replaced with the following: "In some upland valleys, alluvium of the Holocene Series overlies the glacial drift and loess, or it lies directly upon the Paleozoic bedrock."

Comment 8:

Page 4-10, Section 4.3.1.2 - This section presents several isopach and contour maps of the site presumably generated from the geologic database. A check of several data points against geologic logs, particularly on Figure 4.3-19, reveals several points in disagreement with plotted contours or isopachs. Many data points cannot be checked because geologic logs have not been presented in this document or elsewhere. Is there an explanation for these apparent conflicts?

Response to Comment 8:

The contouring package (CPS-1) used in generating Figure 4.3-19 and the other maps in Section 4.3.1.2, is an industry standard. A rectangular grid is superimposed on the control points (data) and the grid nodes are assigned values based on all of the control points within the search limit of that node. The grid nodes, rather than the control points, are contoured. Consequently, the control points which do not coincide with grid nodes may not be precisely honored in the contour map. The continuous surface is, however, best represented in this fashion.

The geologic logs that were used to develop Figure 4.3-19 and the other maps in Section 4.3.1.2 were not included in the RI because of the bulk they would add to the report. These logs are being compiled in a compendium of geologic data and will be available for review at the Weldon Spring Site.

Comment 9:

Page 4-13 - The residuum unit is described as an individual stratigraphic unit in the text but is not represented as such in the Generalized Stratigraphic Column (Figure

4.3-1). There is a problem in assigning it an age but it should be represented, perhaps as "Quaternary or pre-Quaternary" may be most appropriate.

Response to Comment 9:

Recent mapping of the area by Whitfield et al., in 1989 does not mention the residuum as being stratigraphically distinct. Figure 4.3-1 is intended to provide a more regional stratigraphic perspective rather than focusing on site-specific units. The residuum is mentioned in Figure 4.3-1 as being subjacent to various units of Pleistocene age.

Comment 10:

Page 4-14 - MDNR-DGLS does not consider a hydraulic conductivity of 5×10^{-8} cm/sec. to be representative of the residuum unit. Our experience indicates that it has a much higher permeability. We support further sampling and testing of this unit, as mentioned.

Response to Comment 10:

Agree. This sample should not be construed to be representative of the entire residuum unit. However, it does represent the lower end of the range of values possible in this heterogeneous unit.

Four additional samples were sent to the laboratory for permeability testing. Three consisted of noncohesive gravels which could not be tested. The other sample was gravelly, but cohesive. Preliminary test results for that sample indicate a hydraulic conductivity of 3.0×10^{-8} cm/sec.

Text will be changed to indicate heterogeneity of the residuum. The first two sentences of paragraph 4, page 4-14, will be replaced with the following:

"In terms of hydraulic conductivity, the residuum is extremely heterogeneous. Laboratory testing of a sample from near the top of the unit yielded a value of 5.0×10^{-8} cm/sec (1.4×10^{-4} ft/day). Four additional samples have been sent out for testing. Three of these consisted of noncohesive gravels which could not be tested. The other sample was gravelly, but cohesive. Preliminary test results for that sample indicate a hydraulic conductivity of 3.0×10^{-8} cm/sec. As indicated in the previous section, the interstitial clay within the residuum is generally quite plastic and, where sufficient clay is present, forms a tight matrix within the gravel fraction."

Comment 11:

Page 4-28 - The descriptions of gaining and losing reaches, particulary in paragraphs 2 and 3, are not clear because mentioned landmarks are incorrectly named and not represented on the reference maps. Road DD is maintained by the State and might better be referred to as State Road DD. Road C and B are Busch Wildlife Area roads and are not shown on Figure 4.4-9.

Response to Comment 11:

Agree. The figures and discussion presented in Section 4.4.4.2 will be revised as suggested in Comment 11. In addition, work performed by the MDNR to supplement that of the USGS will be acknowledged and Figure 4.4-9 will be modified to be consistent with Plate 7 of MDNR, 1989.

Text revisions will include: Section 4.4.4.2, page 4-27, paragraph 3 - after the first sentence, insert the following: "The information provided by the USGS was supplemented and slightly modified by the MDNR (MDNR, 1989)."

At the end of the same paragraph, add the following: "Figures 4.4-6 through 4.4-8 show the USGS discharge measurement locations and the estimated discharge values for subdrainages near the site. Results of the MDNR and USGS studies are presented in Figure 4.4-9."

Section 4.4.4.2, page 4-28, paragraph 2, sentence 2: change "St. Charles County Road DD" to "State Road DD."

Section 4.4.4.2, page 4-28, paragraph 3, sentence 2: change "St. Charles County Road C" to "Busch Wildlife Area Road C." In sentence 4, change "St. Charles County Road B" to "Busch Wildlife Area Road B."

Section 4.4.4.2, page 4-29, first paragraph, sentence 2: change "County Road D" to "State Road D."

Figure 4.4-9 will be modified by changing "County Road" references to "State Road" and by adding Busch Wildlife Area Roads C and B. An additional change will be made to indicate that a short segment of the Burgermeister Spring branch (drainage 6300) and the segment of Crooked Creek from State Road D to Highway 40 (drainage 6100) are losing streams.

Comment 12:

Page 4-30 - The March 1985 injection of dye was detected only at Burgermeister and its wet weather springs (SP-6301 and SP-6302). Dye was not recovered at SP-6303 (Dean, 1965; MDNR, 1989).

Response to Comment 12:

Agree. Text on page 4-30, Section 4.4.4.3, first sentence, will be revised to read "...dye were detected in those from Burgermeister Spring (SP-6301) and Overflow Spring (SP-6302) (Dean, 1985)."

Comment 13:

Page 4-35 - Second paragraph refers to Figure 4.5-5 but should probably be 4.5-4.

Response to Comment 13:

Agree. Reference was incorrect and will be changed to Figure 4.5-4 (page 4-35, Section 4.5.1, second paragraph, third sentence).

Comment 14:

Page 4-44 - Section 4.6.2.5 - Are final pump test results available? If available, the results should be presented and their significance explained.

Response to Comment 14:

The pumping tests have been performed and the resulting data prelimarily reduced. The results will be available in the Aquifer Characterization Data Report which is currently under development. It is anticipated that this report will be issued in mid-1990.

ATTACHMENT D

Comments of the Missouri Department of Natural Resources

GENERAL COMMENTS

Comment 1:

Although much of the TNT operations formerly located at the Chemical Plant were possibly taken care of at the "burn" sites, I would like to see some discussion of the leveling of the site to construct the Chemical Plant. From Plate #1 it appears TNT plants/lines 1 through 4 were located in areas extensively changed by construction of the chemical plant. It would seem logical that some TNT and DNT contaminated wastes were buried or disposed of on site or elsewhere during the construction of the chemical plant.

Response to Comment 1:

Historical records were reviewed to determine the sequence and extent of Weldon Spring Site operations and construction activities. Activities involved with TNT production and disposal, and chemical plant construction were particularly scrutinized in developing site sampling plans.

Because of the size of the site and the diversity of activities that occured, two sampling approaches - biased and unbiased - were used to provide comprehensive soil contamination characterization. The biased sampling locations were selected on the basis of historical documentation of WSOW and WSUFMP operations and the results of the more recent site investigations. Topographic modifications from cut and fill activities were also taken into account in the selection of sampling locations. Unbiased sampling was conducted across the site to provide a statistically valid database for soils characterization and to document uncontaminated areas (MKF and JEG, 1988j).

In the Phase II sampling effort, chemical soil samples were collected from 245 locations within the WSCP and WSRP areas. Soil sampling locations were surveyed to establish horizontal and vertical control prior to sampling. Soil samples were collected using continuous sampling equipment driven through conventional hollow-stem augers. This sampling method provided a relatively undisturbed sample for chemical analysis and lithologic logging (MKF and JEG, 1989a).

Areas sampled for nitroaromatic compounds included WSOW process areas, drainageways, and the burning area and rubble areas. Nitroaromatic compounds were detected at the 15 locations shown in Figure 5.2-1. The depth intervals and contaminant concentrations are presented in Table 5.2-2. The locations where nitroaromatic compounds were detected by the WSOW biased sampling program generally confirm previous results from the Phase I and IRA studies which indicated that the Ash Pond area is the area most extensively contaminated with low levels of nitroaromatic compounds. Based on review of the historical records describing site operations, a process line for TNT production near Frog Pond was identified. This

process line may have been a source of nitroaromatic contamination in the vicinity of Frog Pond. The contaminated areas are associated with primary TNT production or waste water management.

Location PH2-OWB-001 (C-1) is in the wash house area of TNT Production Line 1. Gross contamination has been identified in similar settings on the adjoining Army Reserve training area (locations PH1-27, 28, 29 and 30). The contamination probably originated as waste water spilled on the soil from the wash house. Most gross contamination in this area was apparently removed during decontamination efforts prior to construction of the WSUFMP facilities in about 1954. The depth to contamination (1.8 to 3.7 m or 6 to 12 ft) is consistent with cut and fill mapping which indicates the presence of 1.2 to 1.8 m (4 to 6 ft) of fill overlying WSOW topography. Construction and subsequent removal of building foundations would have disturbed soil, allowing contaminant migration to the depths which sampling has indicated are contaminated.

Comment 2:

Some of the Interim Response Actions listed in Table 1.2-2 would appear to require a relatively long time to accomplish. ARAR's for these actions are not discussed. EPA policy has stated ARAR's would be followed at "removal actions" to the extent practicable.

Response to Comment 2:

It is the policy of the DOE to comply with all applicable or relevant and appropriate regulations in performing the IRAs. A detailed discussion of ARARs and how compliance will be achieved for each IRA is presented in the engineering evaluation and cost analysis (EE/CA) reports. A detailed analysis of ARARs will be included in the site FS-EIS report.

Comment 3:

The fish sampling for the biological contamination portion of the report did not include any bottom feeders. Since the contaminants could be in the sediments, bottom feeders would more likely be contaminated.

Response to Comment 3:

Agree. The Biouptake Study Sampling Plan (MKF and JEG, 1987b) identified the need and plan for obtaining samples of bottom feeding and other representative fish species from water bodies receiving drainage from the WSS. Fish sampling at the Busch and Weldon Spring wildlife areas was conducted by MDOC and PMC personnel using electrofishing equipment. A few catfish, generally considered to be bottom feeders, were collected from Lakes 35 and 36 and analyzed for radionuclides. No catfish were successfully collected from the other locations at that time. Carp and largemouth buffalo, two predominantly bottom feeders, were collected from the Femme Osage Slough.

Additional sampling was conducted by MDOC in the fall of 1989 to assess lead levels in fish from Lakes 36 and 37. The PMC also collected fish at that time to be analyzed for uranium at lower detection levels. These samples also included catfish. No data are yet available for these samples. Results are anticipated in early April, 1990. These data will be finalized and included in the Biouptake Report scheduled for issue in mid-1990.

Plans for additional characterization work include fish tissue sampling in Lakes 34 and 35. Results of this work will also be available in mid-1990.

Comment 4:

Were the soil samples analyzed by depth interval (relates to comment 1 above)? It was difficult to tell from the report.

Response to Comment 4:

Yes. Sampling depths were established by evaluating cut and fill activities. For example, ordnance works sampling completely penetrated filled areas and sampled original ordnance works topography. The depth intervals and contaminant concentrations are presented in Table 5.2-2.

Text revisions will be made in Section 3.2.1.3, page 3-10, second paragraph. The third sentence in this paragraph (Topographic modifications...") will be deleted and replaced with the following: "Cut and fill activities were also evaluated in determining sampling locations and depths."

Comment 5:

Shouldn't Figure 7 of the report show the Twin Lakes development as a receptor?

Response to Comment 5:

Nitroaromatic contamination has been detected at the Twin Island Lake development. The Army is currently supplying bottled water to residents of the development. Plans are underway to connect the development to a public water system.

DOE recognizes the concern reflected by Comment 5, however, for the present, Figure 7 should remain unchanged since the Twin Island Lake development has not been established as a receptor of groundwater contaminated by substances from the WSS.

Comment 6:

Were the soils selected for background soil sampling of the same toxinomic units as those found at the WSCP site? In some instances the existing chemical plant surface soil may be a subsurface horizon due to the site grading which occurred.

Response to Comment 6:

Yes. The soil samples collected for background determinations were from the same units as those present on site. The following sentence will be added to Section 5.2.1 between sentences 3 and 4 in the third paragraph on page 5-26: "The studies focused on the same soil units at off- and on-site locations in order to compare background concentrations."

Comment 7:

Please keep in mind that those IRA's which call for off site disposal will probably require special solid waste permits.

Response to Comment 7:

The DOE is aware of this requirement for off-site disposal of waste.

Comment 8:

Has there been any effort to explain the differences in concentrations between Table 5.1-11 (BNI samples) and Table 5.1-19 (PMC samples)? The BNI results are considerably higher on average.

Response to Comment 8:

It is not known why the BNI sample results are higher (on average) than the PMC sample results. An evaluation performed to explain the difference in radionuclide concentrations reported in the BNI and PMC data sets is discussed in Section 2.4.4 of Waste Assessment Radiological Characterization of the Weldon Spring Site Raffinate Pits, Rev. 0, DOE/OR/21548-062, August 1989. This report concluded that "there exists a statistically significant difference between the mean values of the two data sets. However, there was no discernible overall pattern of bias between the data sets with regard to concentration value, concentration heterogeneity, or radionuclides".

The PMC followed documented sampling procedures during sample collection and analyses at the raffinate pits. The PMC has also performed data validation on some raffinate pit sample results. Data validation information relating to the BNI data set was not provided in the Bechtel characterization report. Attempts were made by the PMC to obtain this information from Eberline, Bechtel's technical subcontractor, but these attempts were unsuccessful. On the basis of this information, the DOE is of the opinion that the PMC's data more accurately represent the true radiological chacteristics of the raffinate.

Comment 9:

Appendix F and other portions of the report make reference to evaporating the red and yellow waters. This appears unlikely given the flow rates of 40 to 50 mgd.

Response to Comment 9:

Agree. According to Fishel and Williams, 1944, a primary purpose in the design and construction of the waste water treatment plants was evaporation of the red and yellow waste waters. However, no information is provided as to the efficiency or effectiveness of the process once the waste water treatment plants were built.

The following revision will be made to the text in Appendix F, page F-5, paragraph 5. Strike the last sentence ("The lines discharged...") and replace with the following paragraph:

"Due to the state of emergency and apparent low priority placed on wastewater treatment, details on wastewater management practices are sketchy. Early in the operation of the WSOW, wastewaters were discharged directly from production lines or pumped into lagoons. The direct discharge and leakage from the lagoons caused contamination of area streams and springs. After stream and spring contamination was noted, wastewaters were pumped directly to the Missouri River (Fishel and Williams, 1944). At some point, wastewater evaporation and incineration plants were constructed and placed in operation (Greely and Hansen, 1942), however, it is not clear that this treatment practice ever totally replaced disposal in the Missouri River."

Comment 10:

Appendix H makes at least 3 references to the disposal of red water sludges or TNT contaminated material. What efforts have been made to trace the ultimate fate of these materials? Can it definitely be stated they are not buried below the WSCP site or at the Quarry?

Response to Comment 10:

Based on a comprehensive historical review, it was discovered that during decontamination in 1944, residues from nitroaromatic-contaminated material burning areas of unknown locations were scraped into piles and attempts were made to reburn these piles. The burning process was not very successful, so the residues were dumped, presumably in the Weldon Spring Quarry (Hannon, 1944). Figure 3.1-3 indicates the location of a demolition storage area for nitroaromatic-contaminated rubble and a burning ground for nitroaromatic-contaminated material. Figure F-4 also indicates the location of the burning ground.

As described in Sections 3.2.1 and 5.2.1, four soil sampling programs have been carried out at the WSCP/WSRP areas by the PMC. Nitroaromatic contamination was detected in 15 samples ranging in concentration from 0.48 to 307 ug/g. The final phase of samplings included biases for known locations of ordnance works activities, uranium feed materials activities, and a random sampling program. No

nitroaromatic compounds were detected in the uranium feed materials-biased and random samples. With the exception of the abandoned waste pond northeast of Frog Pond, no gross contamination was discovered in the soils sampling program.

The information described above will be added to the text in Appendix F, page F-6, following paragraph 1.

Comment 11:

Has any effort been made to characterize the materials which were dumped into Pit Number 4 in December 1966?

Response to Comment 11:

The DOE is not aware of any effort to specifically characterize the materials dumped into Raffinate Pit 4 in December 1966. However, Raffinate Pit 4 characterization has been addressed in other sampling programs performed at the Weldon Spring Site, including work described in these reports: Draft: Waste Assessment Radiological Characterization of the Weldon Spring Site Raffinate Pits. Revision A. DOE/OR/21548-062. April 1989. (MKF and JEG, 1989e) and Draft Report, Waste Assessment and Chemical Characterization of the WSS Raffinate Pits. January 1989. (MKF and JEG, 1989c).

Comment 12:

VOLUME I: Page 3-23, Section 3.4.5, Domestic Well Sampling: This section references the private well information received from the St. Charles Countians Against Hazardous Waste and the U.S. Geological Survey. Figure 3.4-5 is a preliminary map of the private well locations. The report does not discuss the extensive sampling data on these and other wells obtained by the Missouri Department of Health (MDOH) from 1982 to 1989. Attached is the MDOH data on these wells.

I suggest that you summarize this data and discuss its significance in demonstrating the limits of the groundwater contamination. This information may also be relevant to the baseline risk assessment in that it shows that private wells are not being affected by the uranium processing that occurred at the site. To protect the privacy of individuals, well owner names should not be used in the RI Report.

Response to Comment 12:

Comment is noted. Text will be revised by deleting the last sentence in Section 3.4.5 (page 3-23) that reads: "Future WSSRAP efforts..." The following paragraph will be added at the end of Section 3.4.5:

"Extensive sampling of private wells in the vicinity of the Weldon Spring Site has been performed by the MDOH since 1982. Preliminary data received from the MDOH for the period 1982-1989 indicate that private wells in the vicinity are not being affected by the uranium processing that occurred at the Weldon Spring Site. Evaluation of MDOH private well data is continuing in conjunction with

interpretation of the site monitoring well data. The results of the interpretations will be used in assessing risks associated with the Weldon Spring Site."

Comment 13:

VOLUME III: APPENDIX H, Chronology of Events at the Weldon Spring Site: This chronology is very helpful. However, the information on 1986-89 is very limited. I suggest that you provide a more detailed chronology for these last three years.

Response to Comment 13:

Agree. The chronology in Appendix H will be expanded to present a more detailed discussion of activities during 1986-1989.

RCRA ARAR - COMMENTS (SEE VOL. III APPENDIX B)

General Response to ARAR Comments:

Please note that due to the current status of WSSRAP and potential ARARs, the following response pertains to RCRA ARAR comments 1-16 and State RCRA ARAR comments 1-7.

The identification and discussion of potential ARARs (Appendix B, Vol. III) is very preliminary and not intended to be all inclusive. Identification of ARARs is an integral part of the baseline risk assessment, remedial investigation, and feasibility study. Hence, ARAR determinations are expected to change as new information becomes available and as the remedial action alternatives are developed and evaluated. At this stage of the RI/FS process, it is possible to define with some assurance both the contaminant-specific and location-specific ARARs for the Chemical Plant and Raffinate Pit areas. However, the identification of potential action-specific ARARs is completely dependent upon the particular remedial alternatives being considered. This evaluation will be performed as part of the FS effort. However, it was considered prudent to identify those ARARs that may constrain or define a particular alternative as early as possible in order to highlight problems and expedite the FS process. It should be emphasized that the list of action-specific ARARs, which includes Federal and State RCRA provisions, is not intended to be complete or to presume results of the FS; rather it is an attempt to take an initial look at the ARARs associated with those alternatives which are considered likely to pass preliminary screening and/or which are perceived as being especially problematic.

A more detailed, and comprehensive assessment of action-specific ARARs will be made during the development and evaluation of the remedial action alternatives. In addition, during the detailed design phase, efforts will be made to ensure that the technical specifications will attain ARARs. The comments received on the Federal and State ARARs are both timely and helpful, as ARARs for the proposed remedial action alternatives are presently being identified. All comments pertaining to RCRA ARARs are being assessed for applicability to the various options under consideration.

Comment 1:

General - The ARAR's tables did not address the chemically contaminated portions of the buildings, process equipment, or storage tanks. In certain instances portions of the WSCP buildings and equipment may be considered hazardous waste.

Comment 2:

Table 3 - Has the EPA text; Permit Writers' Guidance Manual for the Location of Hazardous Land Storage and Disposal Facilities: Phase I. Criteria for Location Acceptability and Existing Regulations for Evaluating Locations (Feb. 1985), been evaluated for "To be considered" ARAR's?

Comment 3:

Table 4 - Airborne particulates from handling of RCRA waste must be controlled (264.251, .273, .301).

Comment 4:

Table 5A, Removal Criteria, does not address RCRA materials which are radiologically contaminated. The treatment, storage, and disposal, of these materials will need to meet RCRA requirements.

Comment 5:

Table 5B - Tank storage for some period of time in existing tanks appears to be a possibility. If so then 40 CFR 264.191 would be relevant and appropriate.

Comment 6:

Table 5B, page 3 - Some sectins of 40 CFR 264.193 and 194 may not be substantive (eg. (g), (h), (I)).

Comment 7:

Table 5B, page 4 - Inspections of storage tanks should be relevant and appropriate (40 CFR 264.195).

Comment 8:

Table 5B, page 8 - Inspection of containers would appear to be relevant and appropriate (40 CFR 264.174).

Comment 9:

Table 5B, pages 11 and 12 - Although 40 CFR 264.341, .342, and .344 are directly related to permit requirements they would appear to be substantive since the incinerator efficiency or operating limits cannot be determined by the operator without the required analysis.

Comment 10:

Table 5B, page 12 - The monitoring requirements of 40 CFR 264.347 appear to be substantive to operate an incinerator.

Comment 11:

Table 5B - Closure requirements of 40 CFR 264.351 appear to be substantive.

Comment 12:

Table 5B, page 15 - It would appear that more of 40 CFR 265 subpart P would be relevant and appropriate since it is parallel to 40 CFR 264 subpart O.

Comment 13:

Table 5C - Wouldn't 40 CFR 265.400 be a "to be considered"?

Comment 14:

Table 5G - This table should include the Land Ban (40 CFR 268) since any land filled RCRA materials will have to be in compliance with the treatability standards.

Comment 15:

Table 5G - page 5, Section 315 of 40 CFR 264 would appear to be substantive.

Comment 16:

The proposed rules of 40 CFR 269 would appear to be "to be considereds". Part of these rules were proposed on February 5, 1987 (52 FR 3748).

Comment 17:

Subpart F of 40 CFR Part 264 would appear to be relevant and appropriate to the Quarry site itself.

Response to Comment 17:

The quarry site is being managed as a separate operable unit and ARAR analysis is a part of that effort. Twenty-eight groundwater monitoring wells serve as an integral component of the routine environmental monitoring system in the quarry area.

STATE RCRA ARAS

General Response to ARAR Comments:

Please note that due to the current status of WSSRAP and potential ARARs, the response under **"RCRA ARAR - COMMENTS (SEE VOL. III APPENDIX B)"**, above, pertains to RCRA ARAR comments 1-16 and State RCRA ARARs 1-7.

Comment 1:

Table 3 - MO. hazardous waste regulations chapter 13 (PCB's) incorporate the chapter 7 (TSDF's) requirements. Locations of commercial facilities handling wastes which come under the PCB rules must comply with MO-RCRA location standards. This may be relevant and appropriate at the site.

Comment 2:

Table 4, page 1 - Missouri PCB Treatment, Storage, Disposal facilities must meet the MO. hazardous waste regulations chapter 13 and 7.

Comment 3:

Tank systems should consider the location standards of 40 CFR 264 subpart N in accordance with 10 CSR 25-7.264(2)(J)4, pages 12 and 13.

Comment 4:

Sampling methods for incineration should comply with 10 CSR 25-7.264(2)(0), page 24, where more restrictive than 40 CFR 264.343.

Comment 5:

The requirements of 10 CSR 25-7.264(P) & (Q), pages 24 through 28, would be applicable to treatment or disposal facilities.

Comment 6:

Leak detection and leachate collection systems must have a permeability of at least 0.01 cm/sec. (See 10 CSR 25-7.264(2)(N)2.a.(II), page 23).

Comment 7:

The compliance monitoring point of 40 CFR 264.95 is modified by 10 CSR 25-7.264(2)(F)2, page 5. The establishment of this point is referenced in 40 CFR 264 subpart F (See Table 5G, page 5 and 6).

Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

June 14, 1990

ADDRESSEES

PLAN FOR MONITORING RADIONUCLIDE EMISSIONS OTHER THAN RADON AT WELDON SPRING SITE CRITICAL RECEPTORS - REV. 0, MAY 1990

Enclosed for your information is Rev. 0 of the Plan for Monitoring Radionuclide Emissions Other Than Radon at Weldon Spring Site Critical Receptors - Rev. 0, May 1990.

The Plan contains the DOE monitoring activities to be undertaken at the Weldon Spring Site for compliance with 40 CFR 61. USEPA has concurred in the plan concept, quality assurance and reporting procedures. The Plan will be fully implemented for calendar year 1990.

Sincerely,

Stephen H. McCracken
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosure:
As stated

cc w/o enclosure:
R. E. Hlavacek, PMC

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